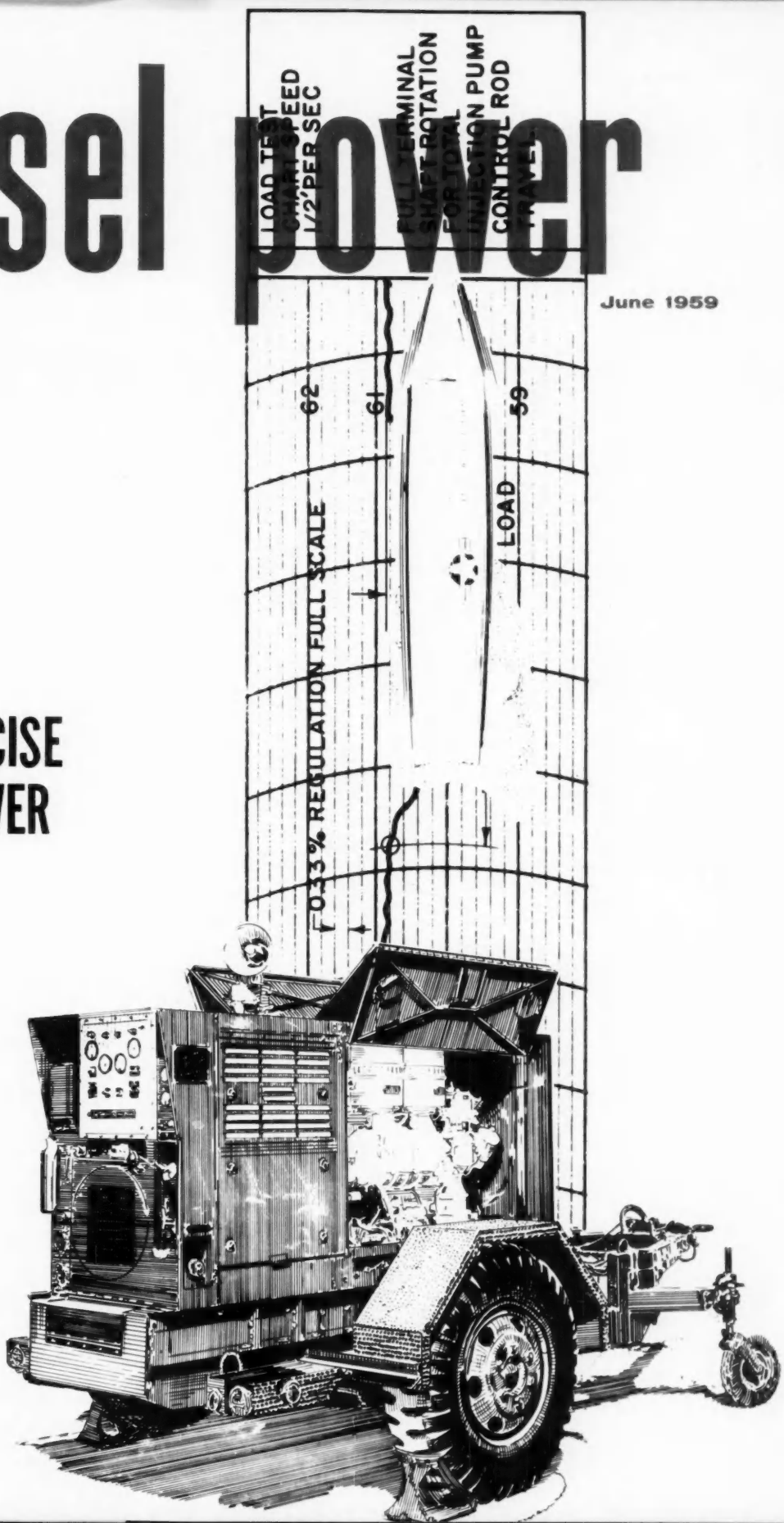
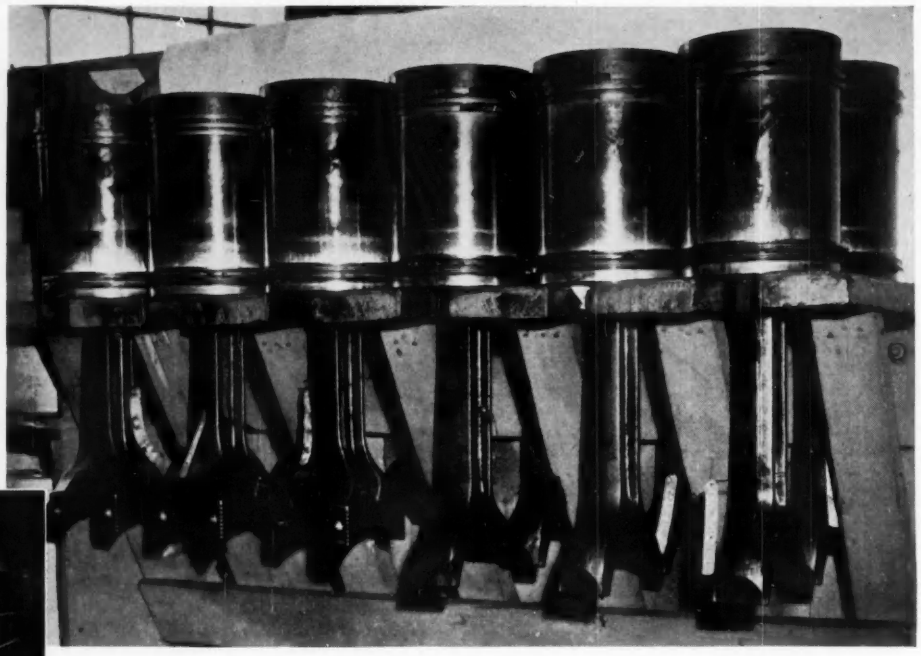
diesel power

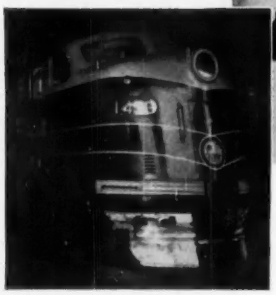
June 1959

PRECISE POWER





The service history of these pistons, removed from a diesel locomotive engine, shows how Texaco Dieseltex assures long-lasting operation. In little less than 5 years, these pistons had provided more than one million miles of operation without parts replacement.



Whether your diesels run on rails, in buses or trucks or are stationary, Texaco lubricants assure dependable operation. Example:

These pistons are free from wear and scoring—even after 1,031,963 trouble-free miles

You can see how the complete set of railroad diesel pistons shown above has been kept clean and protected from wear. This is true even though it's been through a million miles—and almost five years of service—without any parts replacement. The lubricant used to keep the pistons clean was Texaco Dieseltex.

There are Texaco lubricants to protect power in *all* diesels—both moving and stationary—these two ways: 1) Detergent-dispersive action keeps pistons and all other engine parts clean, 2) High film strength prevents wear and scoring by keeping an unbroken film between moving parts. This film is maintained even under severe conditions, throughout a wide range of operating temperatures.

For more information, just call the nearest of the more than 2,000 Texaco Distributing Plants or write:

☆ ☆ ☆

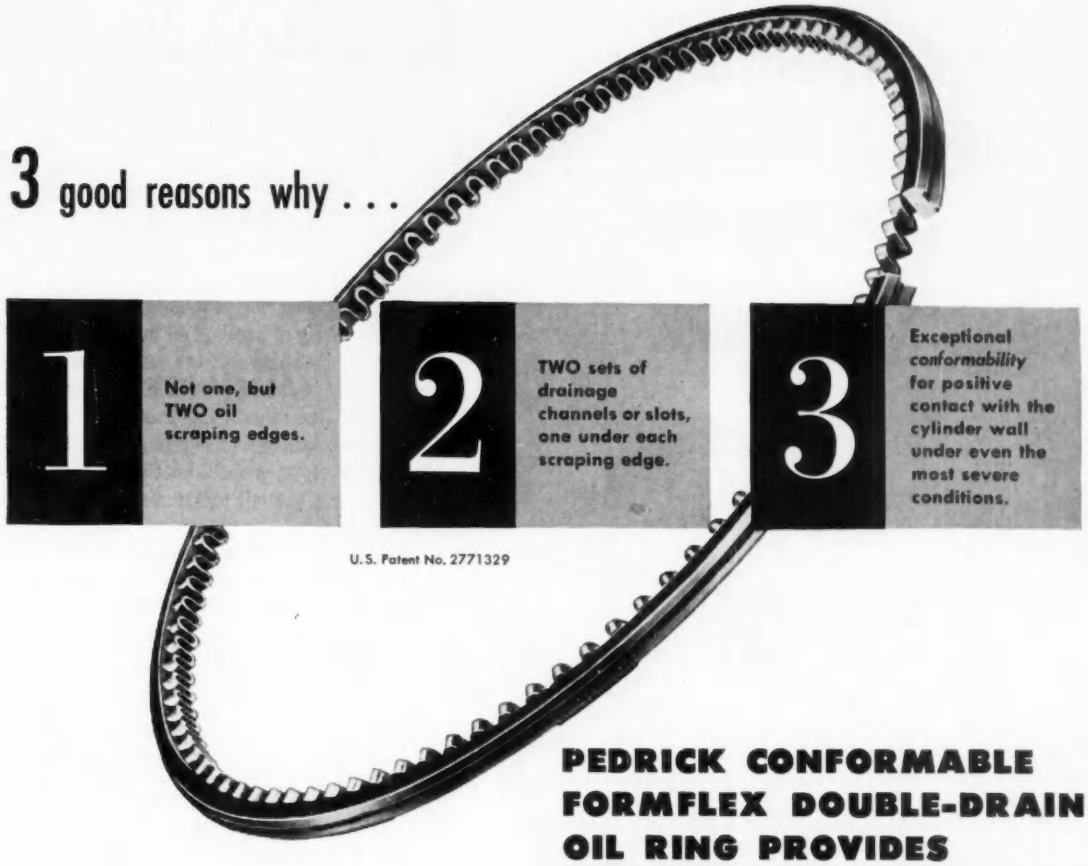
Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

MINIMUM DEPOSITS —NO SCORING after more than a million miles of service lubricated exclusively with Texcco Dieseltex HD.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

3 good reasons why . . .



1 Not one, but TWO oil scraping edges.

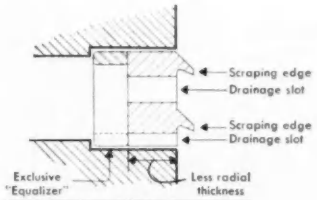
2 TWO sets of drainage channels or slots, one under each scraping edge.

3 Exceptional *conformability* for positive contact with the cylinder wall under even the most severe conditions.

U.S. Patent No. 2771329

PEDRICK CONFORMABLE FORMFLEX DOUBLE-DRAIN OIL RING PROVIDES IMPROVED OIL CONTROL

. . . especially on pistons with oil drainage through the grooves instead of below the grooves.



FOR UTMOST CONFORMABILITY

Users find the Pedrick FORMFLEX Double-Drain DD8 oil ring provides quicker, more effective drainage, giving improved performance in all piston groove designs. And they like its moderate cost . . . the way it installs without difficulty.

You can depend on its conformability. Pedrick's exclusive "Equalizer" steel expander ring exerts a uniform pressure all the way around the cast-iron cylinder-contacting ring. Radial thickness of the cast-iron ring is less, increasing its flexibility.

The DD8 Design Conformable FORMFLEX oil ring is just one of many designs available from Pedrick to help give you long-lived, dependable, low-cost engine operation. Say the word and our Engineering and Consulting Service are at your service. Write, wire or phone: WILKENING MANUFACTURING Co., Philadelphia 42, Pa., Tel.: SAratoga 9-3770. *In Canada:* Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *conformable* RINGS FOR BIG-BORE ENGINES

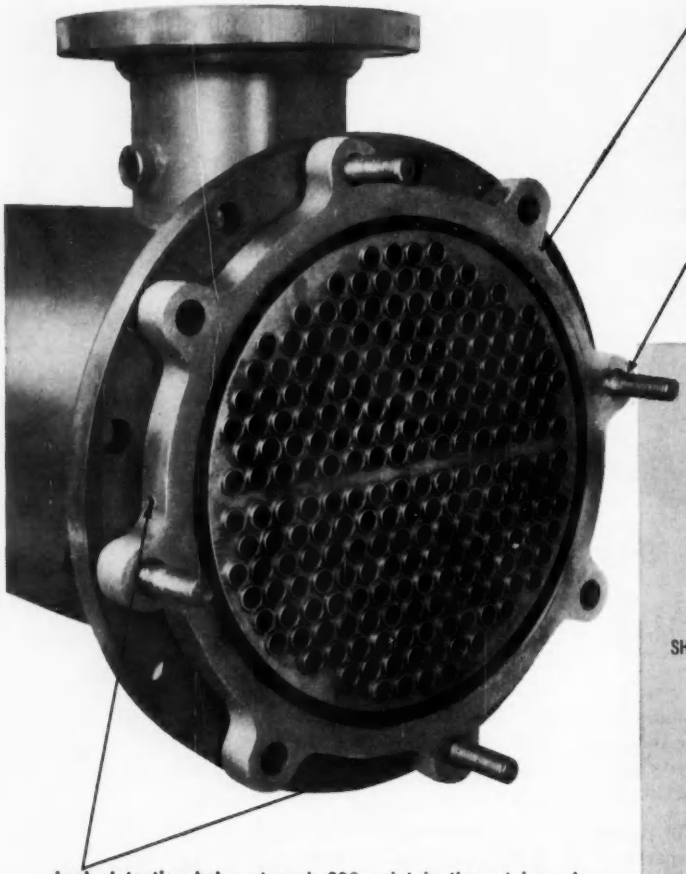
Simply remove the bonnet to make a shell side pressure test

Paracoil

EXCHANGER TYPE PC

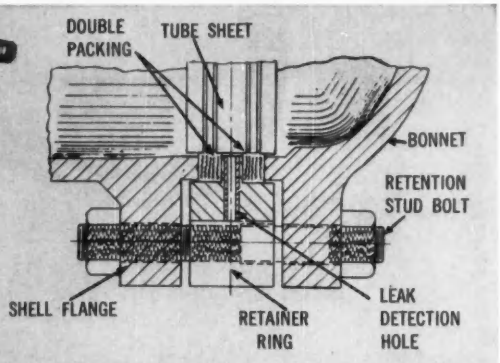
FOR ☐ COOLING ☐ HEATING

☐ OIL ☐ WATER ☐ AIR ☐ GAS



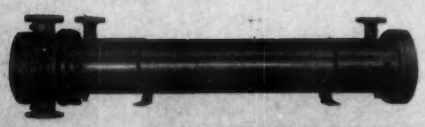
Unique retainer ring permits fast, easy inspection and servicing of packing. All that is necessary to set up a shell side pressure test is to remove the end bonnet by backing off on its single set of holding nuts. The retainer ring continues to hold the shell side packing in compression (see details below). No clamps or special devices needed. Piping connections are left undisturbed.

Retention stud bolts pass through the shell flange and screw into threaded retainer ring lugs, holding the ring and packing in place with bonnet off.



HOW IT WORKS

Section at packing retainer ring weephole. Seepage from either shell or tube sides drips out through copper-lined weephole. If tightening the gasket compression nuts fails to stop the leak, simply remove the end bonnet and pressure-test the shell side to locate the trouble—either the tube-end rolling or the shell-side packing. If neither, then the tube-side packing is at fault.



PARACOIL TYPE PC EXCHANGER

Leak detection holes at each 90° point in the retainer ring reveal any leakage past either the shell or tube side packing. **The absence of leakage indicates that the packing is holding—hence no dismantling is necessary for packing inspection.**

PARACOIL PC Exchanger tubes are straight for easy cleaning. The tube bundle is fully removable.

THESE DESIGN FEATURES SAVE HOURS OF MAINTENANCE TIME EVERY INSPECTION.

For details, write for Bulletin 140-A

DAVIS ENGINEERING

(A Division of American Metal Products Company)

1064 East Grand Street, Elizabeth 4, New Jersey

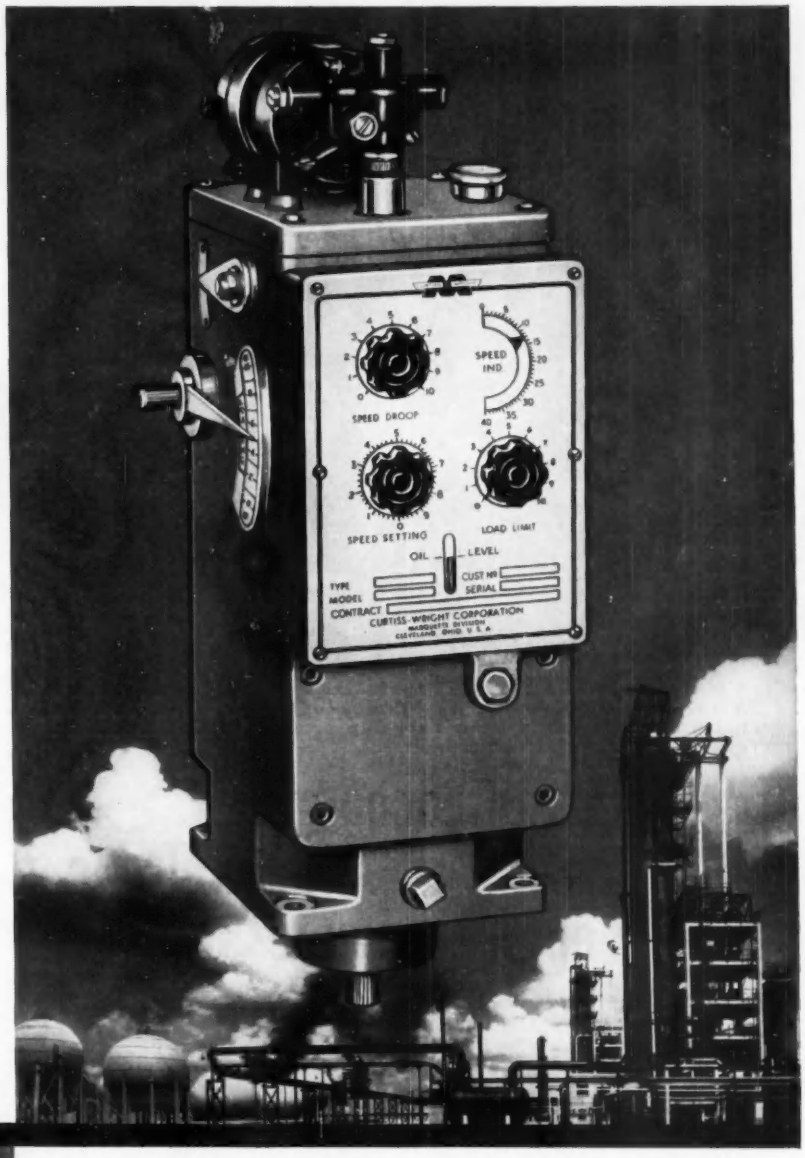
Specify Curtiss-Wright Governors for:

STABILITY—Force balance compensation allows quick throttle changes—no instability.

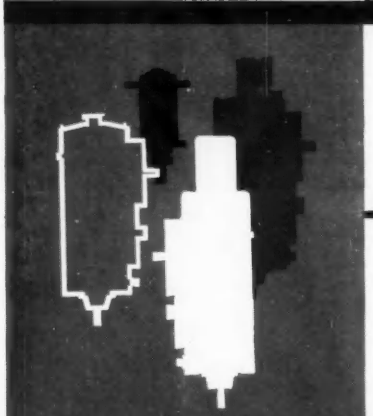
STANDARDIZATION—All models interchangeable, regardless of the type of engine service.

SIMPLICITY—Easily understood operation for emergency repairs.

SERVICE—Field service available nationally and in Europe.



Type M-2 Pipeline Governor



Investigate the wide range of Curtiss-Wright governors for Diesel, gas, and dual-fuel engines.

Massey-Marquette Model Governors are specified by many of the nation's largest gas pipelines, oil pipelines, refineries, gasoline and petro-chemical plants.

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For information on complete line of Curtiss-Wright Governors, mail coupon below.

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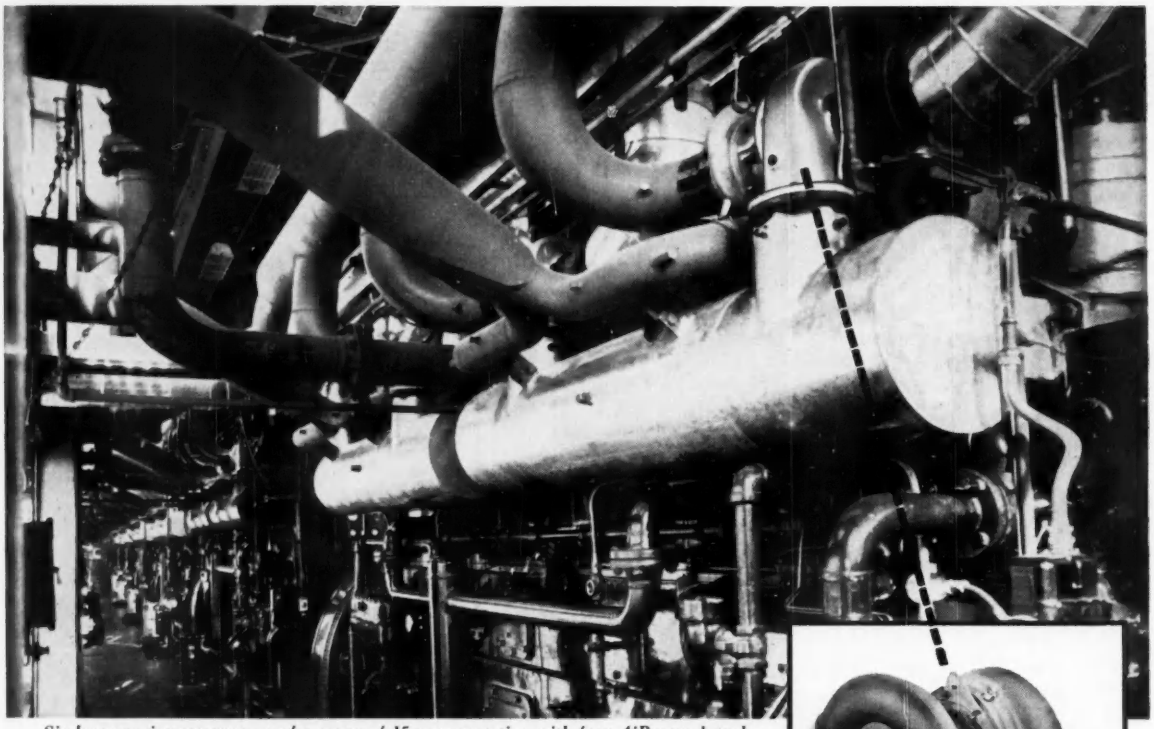
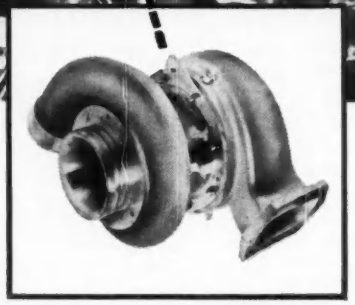
CITY_____ ZONE_____ STATE_____

ENGINE APPLICATION



Six large engine compressors of a group of 15 now operating with four AiResearch turbochargers on each engine in Richfield Oil Corporation's pressure maintenance plant (Western Plant #21) at Coles Levee, California.



Four AiResearch T-30 Turbochargers on each engine.

Multiple-turbocharging Richfield's 2-cycle natural gas engine compressors

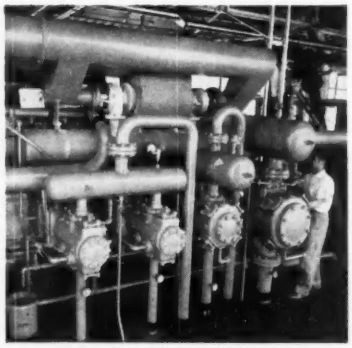
substantially increases plant capacity

The Multiple AIRESEARCH Turbocharger System has greatly increased power output at Richfield Oil Corporation's compressor stations quickly and most economically... thereby increasing the compressor capacity with the same personnel.

Increased engine thermal efficiency is achieved by four AiResearch turbochargers installed on each 2-cycle natural gas engine direct-connected compressor pictured above to produce up to 30-40% more horsepower depending on the model.

Identical production-type AiResearch turbochargers can be retrofitted on different size engines, mounted on the exhaust manifold ... the compressed air directed to the engine intake through an AiResearch intercooler.

More than 30 Richfield compressors of various models will be turbocharged by AiResearch ... another example of AiResearch world leadership in the development and production of air-cooled turbochargers and turbocharger controls for all major engine applications. Your inquiries are invited.



First AiResearch installation at Richfield's Coles Levee absorption plant on one of several compressors with two turbochargers ... engines now in their third year of continuous trouble-free operation.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

editors notes...

You'll want to read about...

Diesels for department store delivery fleets . . . one big store is interested . . . wants to know if diesels can save them money. Here is a direct challenge to our industry and maybe, the key to an exciting new market (Pg. 10) . . . .

Two military applications . . . one in SAGE facilities, the other in "precise-power" ground support equipment for missiles and jets . . . both applications proving up the reliability and dependability of diesel power (Pgs. 12-15) . . . .

A practical high school diesel class where students are learning by doing . . . might be an idea here for cooperation from the industry in the interest of both public relations and in building a reserve of trained diesel men (Pg. 17) . . . .

Several important developments announced by EMD . . . introducing 3 new engines and 2 new series of locomotives . . . features include more power and improved performance (Pg. 18) . . . .

diesel power

Established in 1923 **Vol. 37, No. 6** **June, 1959**

The Magazine of Piston and Turbine Power

Editorial

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Diesel Publications, Inc., 80 Lincoln Avenue, Stamford, Conn.

You'll want to read about...

Farris Pickering's new speed-droop hydraulic governor . . . with trend toward this type of governor growing, this looks like a good one, giving close speed control and accurate matching of fuel input to load demand. (Pg. 23)

A Plymouth-Perkins cab in service . . . here is what the operator has to say after 6 months of operation in New York City traffic, and what the driver reports. (Pg. 26)

AiResearch's multiple turbocharger installation on gas engine compressor units . . . how early test data proved the use of small, high production units meant an important increase in power, lower maintenance costs and less noise (Pg. 30) . . . .

Expansion of Roosa-Master production facilities . . . a good indication of growing sales of this type of injection pump, and a barometer of many new applications of light, high speed engines. (Pg. 32) . . . .

New products, new literature, news of the industry, your industry, a growing field full of new opportunities for well-informed diesel men growing with it.

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London, W. C. 2, England

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Frankfurt/Main, Germany

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	75¢	$4.00	$7.00	$ 9.00
Canada	75¢	4.00	7.00	9.00
Foreign	$1.50	8.00	13.00	17.00

Back Issues — Twice Published Price

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER, for June, 1959, Vol. XXXVII, No. 6. It is published monthly by **DIESEL PUBLICATIONS, INC.**, Executive and Editorial Offices at **80 LINCOLN AVE., STAMFORD, CONN.** Tel. DAvis 4-2131. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1959, Diesel Publications, Inc.

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The Piston with "Double Bonded" "Ni-Resist Iron" Top Ring Section STOPS! RING GROOVE WEAR!

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Exclusively **DOUBLE BONDED**
METALLURGICALLY Al-Fin Process
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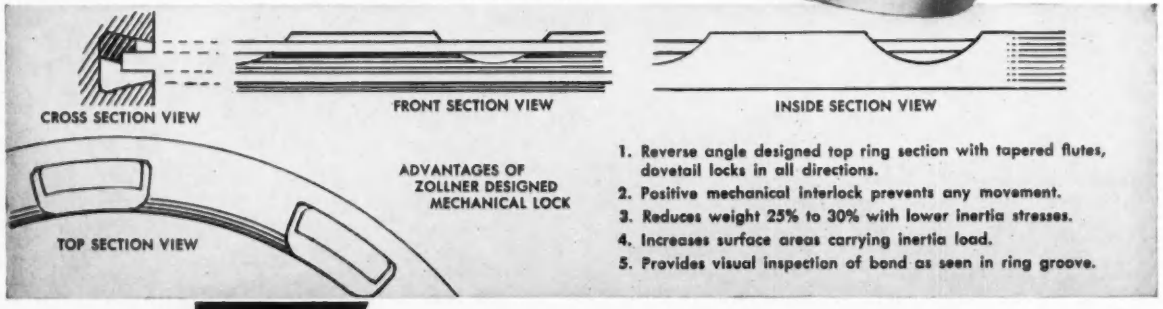
Keeps Engines Powerful Longer — at Lowest Cost

"A sensational development — the greatest mileage piston we have ever used." Everywhere, engine builders and transport operators enthuse over the performance of Zollner Bond-O-Loc Pistons. Top ring groove wear problems are eliminated by the "Ni-resist" Iron section *permanently* incorporated with the double bond of *both* Al-Fin metallurgic *and the exclusive* Zollner mechanical lock. Separation failure is impossible. For longer piston life and lower maintenance cost, we suggest your immediate test of Bond-O-Loc advantages.

*T.M. Reg. Pat. App. For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INSIDE SECTION VIEW
TOP SECTION VIEW
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THE ORIGINAL EQUIPMENT PISTONS

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Editorially speaking -

You've Got to Spend It to Make It

Somebody has to spend some money. Interest in diesel economy for vehicles of all sizes is growing. Take a look at this month's lead article. Here's a real challenge and one that could have far-reaching effects—unless costs strangle the whole idea at birth. Costs and availability are the keynotes that will determine whether or not we have many diesels in light short-haul and stop-and-go service. Before anyone digs up the time-worn arguments to prove that diesels can't pay for themselves in such service, let's accentuate the positive. It's being done every day of the week in Europe. And contrary to common belief, it's not due to the high cost of gasoline. We can't speak for all Europe but in England where most trucking is dieselized, diesel oil and gasoline normally cost within a penny of each other. Light trucks pay out in reduced fuel consumption, lower maintenance costs and higher availability. Here's the nut: How large a cost premium for the diesel can you amortize in a reasonable time? Right now our premium is high—perhaps too high. But this is not necessarily a static situation. It's been pulled down substantially in the past few years. Now think of the effect if production on suitable models could be doubled—or tripled. It's possible. Perkins in England builds at least half as many engines per year as our whole industry and a high percentage go into transport service. Mercedes-Benz quotes about a $277 premium for the diesel in the Model 180 and $327 extra for the 190's diesel. Volume does it. If you want to get it, you have to go after it. Spend some money making suitable diesel vehicles available to show what they can do. Some pioneers may hold still for buying an engine and paying for conversion but not the bulk of potential customers. Why should they? As Mr. Moisio states in the article, he's in the department store business, not in truck development. He wants a product to test, use and, if satisfactory, buy. If our industry wants to tap this huge potential market it will have to spend some money. Call it market development. Make products available, hold introductory costs down and soon volume will take care of the cost picture—with a profit.

BPE

highlights

New York City's controversial 10¢-a-ride taxi-tax will be studied by special committee setup because of vigorous objections to this levy . . . but special tax was still part of Mayor Wagner's presentation to the City Council late in May. Approval should spur taxi fleet owners into conversion to diesel . . . resultant savings could cover rise tax adds to already inflated operating costs.

1958 saw 234,336 wheel-farm-tractors produced . . . 71% gasoline, 24% diesel and 5% LP-gas. Tractor horsepower still increasing with 60% of '58 wheeltype units produced in the 40-belt hp class and up. One manufacturer that introduced a diesel model less than 2 years ago will probably build 12 to 15 thousand this year.

New locomotives on order April 1 totaled 589 of which 566 are diesel-electric and 23 gas turbine-electric . . . these last having been on order for some time. Comparison with Association of American Railroads, figures for last year are more than favorable . . . 206 total of which 176 were diesel-electric and 30 gas turbine-electric.

Doubling of gas utility and pipeline industry in next 12 years predicted by J. Theodore Wolfe, president of the American Gas Association at 51st annual Southern Gas Association convention . . . also noted natural gas industry is 5th largest in U. S. in terms of assets including 1300 gas distributors; 100 pipeline firms; 7-8000 producers; 600 appliance manufacturers and some 4000 distributors of LPG.

Federal Power Commission has accepted an application from Columbia Gulf Transmission Co. for the installation and operation of an experimental remote-controlled compressor unit which will be the first of its kind. Components are a Clark 2-cycle, 10-cylinder 4000-hp vee-engine which will drive a centrifugal compressor through a Westinghouse speed-increasing gear. Installation is planned for Columbia Gulf's existing Hampshire, Tenn. station . . . completion date—November 1.

Caterpillar centralizing Engine Division operations at new Mossville Industrial Engine office building. Purpose of move to center all activities in single location is to gain better coordination enabling the division to widen its opportunities . . . should also mean a more economical operation.

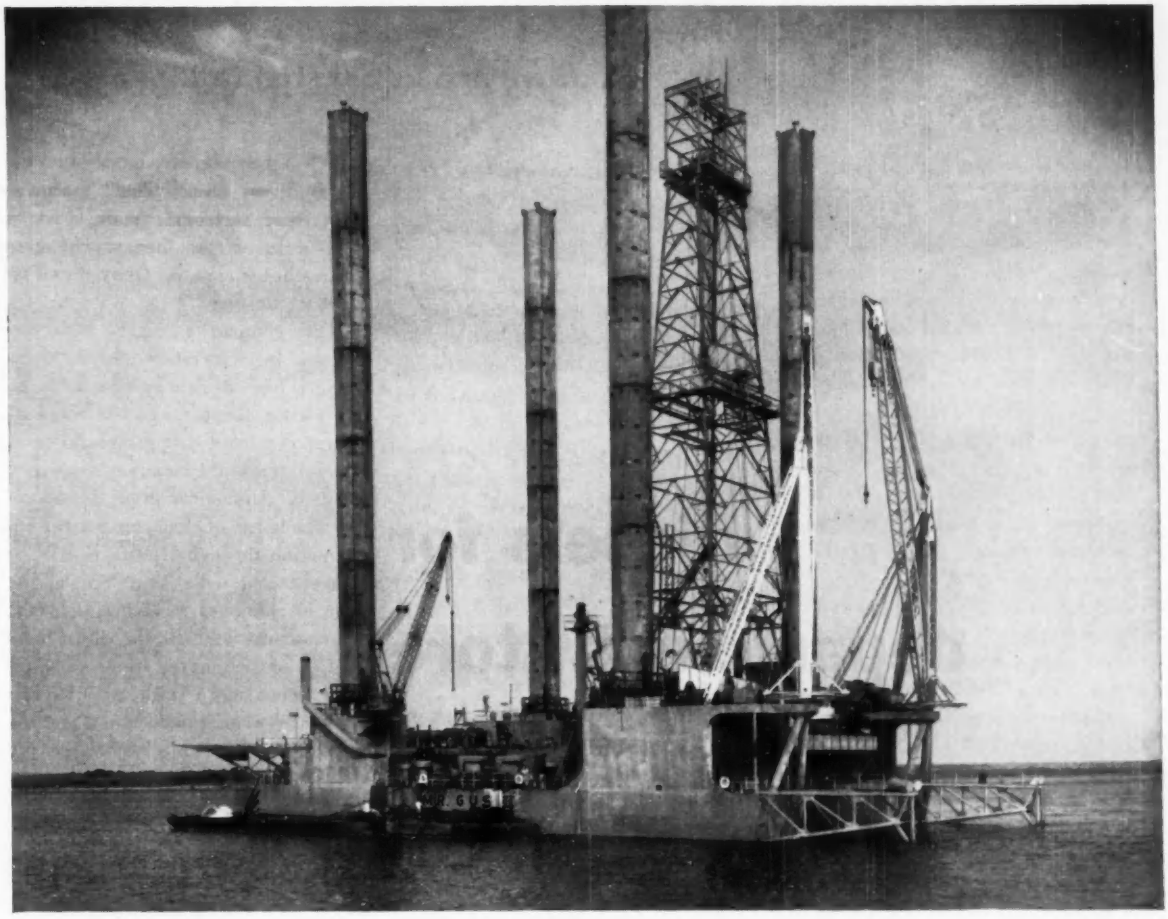
New technology of fiber metallurgy promises exciting things to come . . . self-lubricating bearing material and improved brake linings are but two potential applications of new material being developed at Armour Research Foundation. Slabs of metal fiber have already been produced through basic process in which metal fibers are felted and then heat treated so that randomly interlocked fibers are welded at each contact. You'll be hearing more about this new material in the future . . .

Also, small gas turbine generator sets are being developed for U. S. Air Force under technical guidance of Armour Research Foundation. To be used as portable power source for ground electronic systems, development involves rather severe design goals . . . small power ratings of 10-kw to 60-kw . . . light weight, 10-lbs per kw and low specific fuel consumption of 0.7 lbs per brake-horsepower-hour . . .

And from the Inventors' Corner comes word of a single-cycle engine. Don't know how it works but will try to find out . . . reportedly small and light for its output, engine is air-cooled . . . capable of higher power by putting units in tandem. One major builder is said to have evaluated it and commented that its "features and design could no doubt be made practical".

Another innovation from a different source is a combustion chamber-piston combination which "operates and starts perfectly with a compression ratio of 11 to 1". Tests were made in a modified automotive-type diesel. Don't know how he gets required ignition temperatures, especially when starting, but inventor says it works and points to the advantages of lower pressures.

FROM GENERAL MOTORS...TEMPERATURES MADE TO ORDER



20 HARRISON-COOLED DETROIT DIESEL ENGINES PROVIDE 5,000 H.P. FOR MR. GUS II—WORLD'S MOST POWERFUL OFFSHORE DRILLING RIG!

Harrison heat exchangers are rugged, reliable and compact—engineered and built to General Motors standards of quality.

Drilling for oil in 150 feet of water is a powerful assignment—but MR. GUS II handles it with ease! And Harrison heat exchangers are on the job, keeping a close check over engine oil temperatures on this giant Diesel-powered drill rig. Harrison heat transfer equipment provides optimum cooling efficiency and economy even under the heaviest loads and continuous operating assignments. These products—backed by over 48 years' experience in the heat-control field—are found in every line of industry and defense. If you have a cooling problem, look to Harrison for the answer.

TEMPERATURES MADE TO ORDER

HARRISON

AIRCRAFT, AUTOMOTIVE, MARINE AND INDUSTRIAL HEAT EXCHANGERS

GM GENERAL MOTORS

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

" . . . we are interested in diesels as a

Diesels for department store delivery fleets?

***OPERATION DIESELIZATION** continues . . .*
publicity given diesel economy in taxi operation across the country has struck a spark.
The door is open . . .
an opportunity to show that fuel savings, long service life and high availability can make diesels pay in this service.

"CAN diesels save money in a delivery fleet?" That's the question received from a store, part of one of the largest department store chains in the country. Okay, diesel industry, can they?

The company's name is well known, bears prestige and its operation is big—big enough for us to go right after the story. In our contacts, it was requested that for purposes of this interview, the company's name be omitted. Anyone wishing to accept the challenge offered can get the information through DIESEL POWER.

We talked with John Moisio, the man in charge of receiving, delivery, warehousing and all the allied jobs that go on behind the scenes of a big department store with a suburban branch. We questioned him to get his thinking on the subject of diesels for delivery fleets.

"Mr. Moisio, what prompted your letter to us?"

"Transportation is part of this job. We get goods in by common carriers from all parts of the country and then we have our local delivery and interstore transportation to worry about. I've been aware for some time of the economics of diesels in heavy trucks and on the railroads.

"Recently, someone called my attention to an article you ran on diesel taxicabs. I looked up your magazine and, I believe, in your April issue you had an article giving some interesting operating figures on short-haul service on the West Coast. If diesels are small enough to handle taxicabs, and can make the savings quoted in the other article, I can't see why we couldn't cut our delivery fleet operation costs."

"Operating costs, then, are the big thing."

"Right, and that includes all the costs of running a fleet—gas and oil, batteries, tires, all maintenance and even

way to cut our delivery costs . . . "

the cost of towing in a break-down. The department store business is highly competitive and delivery is a big cost item. Any significant savings here mean a lot to the overall operating cost statement."

"What do you have in your fleet?"
"First, we have 47 package delivery trucks, Fords and Chevies. These are rated ¾ ton. Next, we have 23 furniture vans. These are 2-ton Whites. Then we have four White 10-ton tractors. Finally, we have a pair of 2-ton Fords that we use as relay trucks. That's our present fleet."

"If you were to get some diesels, are you planning any changes in size or type?"
"No. The fleet is pretty well balanced in both sizes and types."

"Now, let's talk about operation. What are your average mileages?"
"It varies with each type. We've worked it down to daily averages . . . package delivery trucks—65 mpd; furniture vans—63 mpd; tractors—45 mpd; and relay trucks—35 mpd. As you can see, mileages vary between 10,000 to 20,000 miles a year—not many but they're hard miles."

"What about average road speed and length of haul?"
"On road speed, our delivery department tells me they don't get out of second on a bad day. Actually, we've found no point to figuring it out. As to length of haul, all I can say is that it is 'multiple-stop' operation."

"Are there any special requirements in your type of service?"
"Nothing in particular. I would say that it's the same as any city operation—like your cabs for instance. Plenty of stops and starts and a great deal of idling."

"How about operating data to give the diesel boys something to shoot at? Fuel consumption, for example."
"Let me get the records . . . On package delivery trucks—7 mpg; furniture vans—6 mpg; tractors—a shade over 4 mpg; and on the relays 4.5 mpg."

"How about service life?"
"This is an area in which we would like some definite improvement and some of the figures you have published for diesels look awfully attractive. We would hope to realize big savings here—perhaps as much or more than we could save on fuel in view of our relatively low mileage.

"At present, engines are given a tune-up—ignition points, plugs, carburetor settings, etc. are checked and necessary work done—at 8000-mile intervals. Engines need a top overhaul at about 25,000 miles and get a major overhaul at an average of 45,000 miles.

"Ours is a hard, dirty engine service. With the idling, multiple-stop operation plus heavy traffic, engines never get up to proper temperature no matter what the temperature gauge says."

"What about horsepower requirements? You may get somewhat less in the diesel for the same size and weight of engine."
"How much horsepower do you need to idle? Or in the lower gears? All we need is enough to stay with traffic. I think that we have too much now and that it hurts our mileage. The engines work most of the time at only a fraction of their top power."

"Just how would you like to introduce diesels into your fleet?"
"We'd like to put in a few on a trial basis. Obviously, the place to start would be in the ¾-ton package delivery trucks and the 2-ton furniture vans. These constitute 62% and 30% of our fleet respectively for a total of 92%. Here's where real savings can be made.

"Now you tell me. Are such trucks available? Where can we get some to try out?"

"That's the jackpot question. We don't know of any diesel-powered domestic-built production trucks in those sizes. In Europe, yes. You may have to get into a conversion. We have the engines and it is being done. Would that suit you?
"Look, I'm only interested in two things—results and costs. We'll try a new truck or convert an existing one, depending on what it's going to cost us. I realize that this is a relatively new field for diesels but there is a limit to how much pioneering the customer should be expected to do or spend.

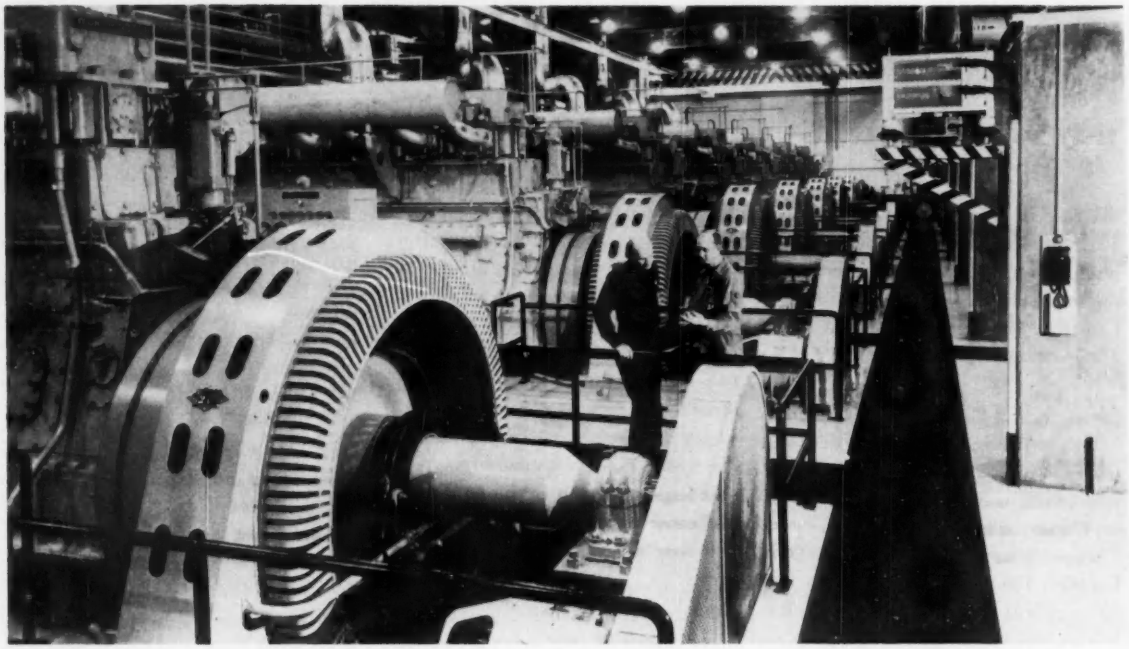
"From what you've told me and from what I've read lately, some of the diesel engine builders feel that they have a big future in powering the lighter trucks. If the diesels can do what they claim, I'd say that the market would be tremendous. How many million small trucks are there?

"It seems to me, as a potential customer, that if they want this business they should have some trucks built up and available for trial. Today, every salesman that tries to sell us something has samples.

"However, if we could work out something on a cooperative basis, we'd take a good long look at it. We're perfectly willing to pay for what we get but unless we are able to amortize our investment and show a profit in a reasonable time, what is the point of the whole thing? We're in the department store business, not in the development of diesel trucks.

"To sum up our position, we are interested in diesels as a way to cut our delivery costs. From all that we know, we think that they can do it. We'd like to try a few. They should be in the ¾-ton and/or 2-ton sizes that constitute most of our fleet.

"We think the diesel industry has something to offer us and, conversely, that we are offering them an opportunity to penetrate what could be an important new field. If someone has a proposition, financially sound, we would be glad to sit down with them and talk it over."



Diesel Power for SAGE

SEVEN Worthington diesels above are busy turning out over 12,000 bhp to drive seven 1250-kw generators that furnish all of the prime-power to operate this SAGE facility near Syracuse, N. Y. Reliable, economical diesel power is playing a vital part in our air defense system.

SAGE (Semi-Automatic Ground Environment), is our vast new electronic air warning system. Electronic computers, "brains" of SAGE, have the almost human ability to receive, memorize, calculate and record vital flight information instantaneously in the form of an intelligible code. In operation around the clock, these computers require the same amount of electrical power that would provide for the needs of a community of 20,000.

Another vital component of SAGE installations, powered by the Worthington diesels, are four, 400-ton air-conditioners. These centrifugal refrigerating machines must maintain a constant temperature (approximately 72°F) and humidity for the electronic equipment. Temperature in the SAGE building is extra critical for efficient operation of the electronic gear.

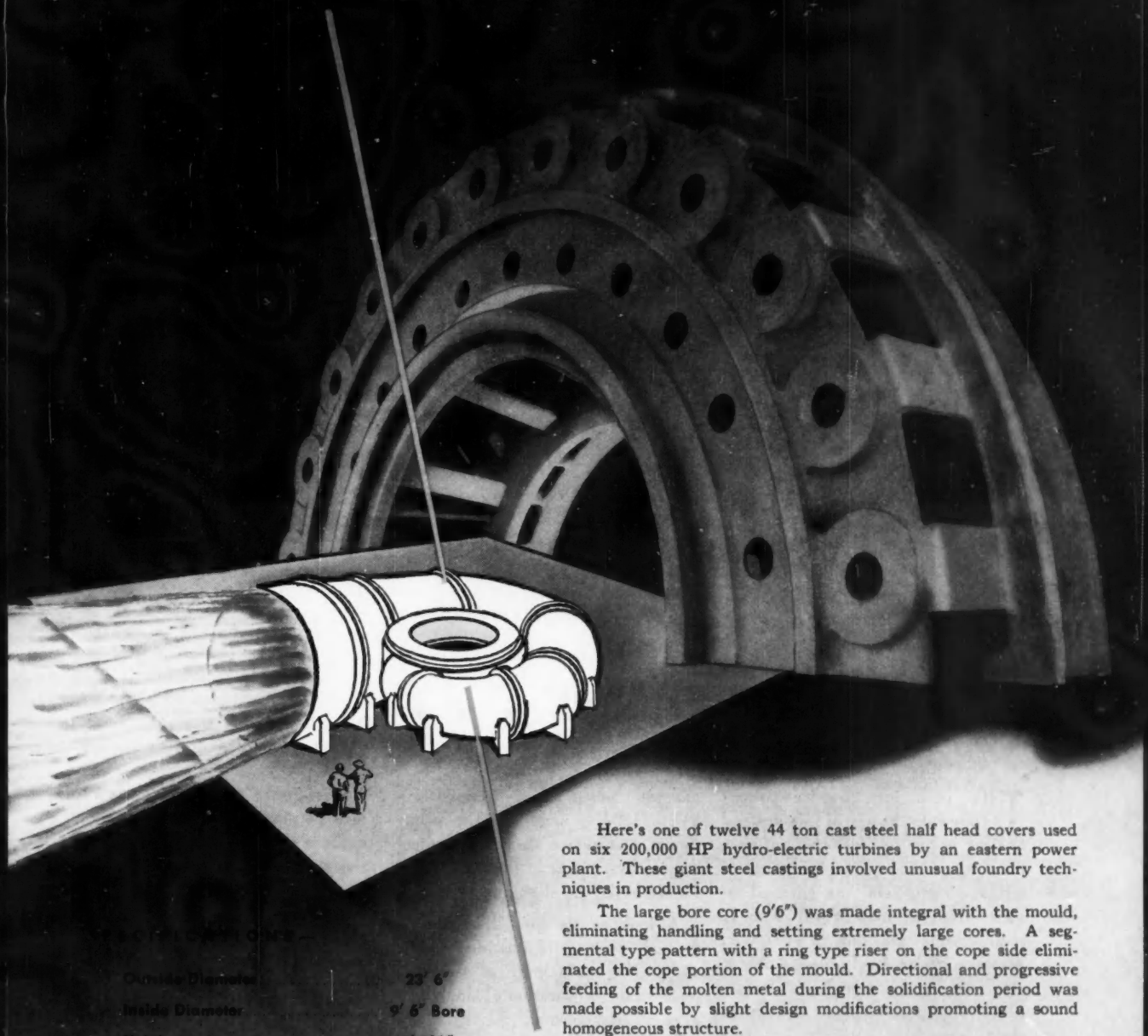
Each computer contains over 58,000 electronic tubes, each individually air-conditioned. Together, they generate enough heat to warm 45 homes in 20°F-below weather. If the air conditioning should fail, the temperature in the building would climb to 150°F within 2 minutes!

Diesel power for SAGE is another example of how the industry is serving the nation.

Maintenance control room monitors operating status of all primary pieces of equipment in the powerhouse.

Power distribution is through high voltage switchgear on right. Low voltage switchgear on left receives power from motor generator room.

Cast Steel Harness for 200,000 Horses



Outside Diameter	23' 6"
Inside Diameter	9' 6" Bore
Height	5' 1¼"
Wt. of (Half) Head Cover	88,510 Lbs.
Wt. of Risers and Gates	93,000 Lbs.
Total Metal to Pour	181,510 Lbs.

Here's one of twelve 44 ton cast steel half head covers used on six 200,000 HP hydro-electric turbines by an eastern power plant. These giant steel castings involved unusual foundry techniques in production.

The large bore core (9'6") was made integral with the mould, eliminating handling and setting extremely large cores. A segmental type pattern with a ring type riser on the cope side eliminated the cope portion of the mould. Directional and progressive feeding of the molten metal during the solidification period was made possible by slight design modifications promoting a sound homogeneous structure.

After stripping, the castings were subjected to hydro-blasting and arc-air method for excavating surface imperfections. Finally, rigid dimensional inspection was followed by magnetic particle and radiographic examination at critical areas.

Here, at Erie Forge & Steel, experienced engineers, metallurgists and craftsmen control quality every step of the way from raw materials to finished steel casting. Consult with us on your steel casting and forging requirements.

•

ERIE FORGE & STEEL CORPORATION

ERIE, PENNSYLVANIA

PRECISE-POWER is a new term in the diesel industry. Its meaning is intimately involved with its application. That is as a power source for the increasingly complex problem of ground-support equipment for our sophisticated weapons systems. The job that "precise-power" must do is to provide electrical power to prove our modern planes and missiles fit for flight.

Close voltage and frequency control is the key to what the military wants from these new diesel-driven generator sets.

In addition to designing and providing highly reliable diesel engines, our industry is continuing to make lighter and more compact prime movers, thus more mobile. "Precise-power" sets in four distinct ratings are already in field use for a large variety of missile weapons.

"Precise-power" unit used in ground-support of missiles weapons systems . . . a mobile, compact diesel-powered package.

Precise power . . .

THE need for "precise-power" grew with the age of missiles and nuclear weapons. The concept of electric power for ground-support of military equipment has changed to such a degree that World War II requirements are now antique. Weapons under development will just about make them archaic. Today, electric ground-power equipment must serve the critically sensitive circuitry of fantastically complex and expensive missile systems and aircraft.

To meet these demands a new family of military engine-generator sets has been developed. These rugged, highly mobile, large and small blocks of electric power are suitable for operation by unskilled personnel under a wide range of climatic conditions. The members of this family consist of d-c, 60-cycle and 400-cycle generator sets in ratings from 0.0150-kw to 150-kw, inclusive. The prime mover, and almost always the critical major component, in this precocious family is the diesel engine.

A look at the job that modern ground power units must do tells the story. The multiplicity of transient loads in the preparation of late model aircraft, and missiles, for flight can be pretty awesome. For example, in checking out a modern aircraft, electric motors are used for a variety of operations. Starting and stopping of these motors during maintenance operations places transient loads on the power-support unit. In checking out electronic systems aboard such aircraft, there must be a supply of cooling air. If this is supplied from an on-board conditioner, electric power must come from the support unit. "Precise-power" must be supplied to check-out radar gear. All of these transient loads make the problems of frequency and voltage regulation more difficult. And when we get into the considerably more complicated check-out equipment for missile weapons systems, we begin to get a picture of the demand on today's ground-support unit.

Project "Precise Power"

In 1948 the Engineer Corps was assigned the job of sparking a development program for engine-generators, equipment that would function within well-defined performance characteristics. And moreover, it had to be lightweight, reliable and highly mobile.

At that time it was found that generator design had not progressed to

the point where industry could guarantee close wave form tolerances on production generators or make definite commitments with respect to the transient behavior of small, lightweight generators.

Working in cooperation with the Engineer Research and Development Laboratories, industry responded to the military need. A number of remarkable developments took place within the next few years. As a result of this program, "precise-power" came into being and the art of generator design and engine-generator set production took a giant step into the missile age.

GM's 100-kw Unit

Working as a prime contractor, General Motors has developed a new light-weight, "precise-power" generator set which meets the exacting tolerance regulation standards set up by the Armed Forces. Through a look at the features of this unit we can see what makes "precise-power" tick.

This 100-kw, 3-phase 50/60-cycle, 208-240/416-480-v unit operates at 1500 and 1800 rpm. Its heart is a 6-cyl Series 71 GM diesel engine. The complete set weighs only 5800 lbs.

"Error-Anticipators"

Two developments are largely responsible for the breakthrough to "precise-power". First, the electric-load-sensing governor has made possible the maintenance of a balance between load and engine output. By incorporating an electric load-sensing circuit in the governor, the speed-sensing element is supplemented. This load-sensing circuit acts to keep the throttle at a position so that engine output will exactly equal load demand. Its corrective action does not have to wait for a speed-error signal. It is this feature that gives the exceptional speed stability of "precise-power" generator sets under transient load surges.

The Delco Products Division of GM, working with the military, built a second "error anticipator" into the generator controls.

Three items were used which had never before been applied to this field —the magnetic-amplifier, the transistor and the load-compensated static exciter. They afforded the opportunity of eliminating a source of troublesome maintenance problems — commutators and arcing contacts in voltage regulators. But more importantly, the load-compensated static exciter not only replaced the rotating exciter, but made it possible to improve transient response.

This type of static exciter consists of a rectifier assembly and a magnetic core wound with insulated copper wire. It has no moving parts. It is so designed that a sudden rise in generator load current reacts immediately through the exciter to change the generator excitation and so tends to maintain constant generator terminal voltage. This instantaneous response accounts for the remarkable voltage stability of "precise-power" sets under load surges. It is, of course, a compensation for load changes only, not for generator speed or temperature. For close automatic voltage regulation, a voltage regulator must be used. It must be carefully matched with the exciter to keep the regulator from nullifying the "error-anticipation" of the static exciter.

As a result of these developments "precise-power" sets have voltage regulation, frequency regulation and wave form from 2.5 to 12 times as precise as the corresponding values of the general-purpose sets.

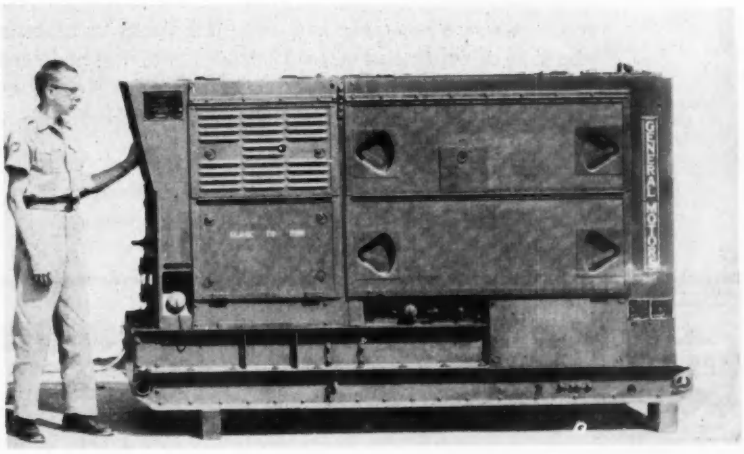
Tomorrow's Problems Today

As the complexity of our weapons systems deepens, as it surely will, ground-support units will have to meet even more exact specifications. Tolerances will shrink. The trend in voltage regulation looks now to be toward not more than a quarter of one percent. Frequency regulation will go lower than that in special applications.

The diesel industry will continue to supply reliable, compact mobile prime-movers. The gas turbine is getting a long look from the military right now.

But perhaps more important, from the general industry stand-point, is the fact that these developments are raising industry standards. Delco Products, as a result of their work in the development of "precise-power" has stepped up their work in new products research and in generator controls. They are now working on unified systems. Better production methods producing better equipment will, in the long run benefit the user.

And better equipment giving better performance for a longer life, at lower cost, is the goal.



GM's 100-kw diesel engine generator set. Man beside unit gives good indication of size. Operating weight of this unit is 6600 lbs.

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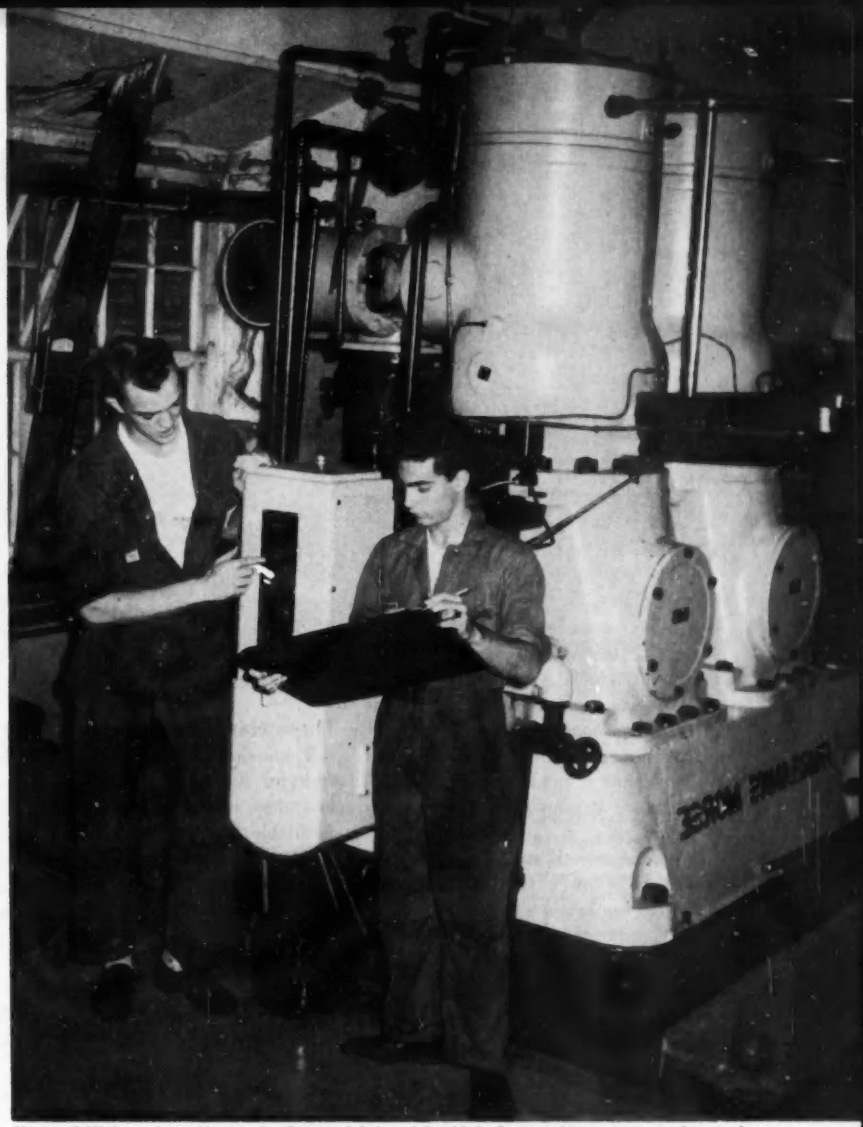
High school students build and run a diesel

by Matt Morris



Hayward High students Vernon De Costa (right) and David R. Court take governor wedge readings while student built Fairbanks-Morse 2-cyl diesel works making electric power for shop classes.

A two-cylinder Fairbanks-Morse Model 32E14 diesel engine driving a 100 kw a-c generator is the pride of the diesel mechanics class at Hayward Union High School, Hayward, California. Students of this industrious class actually assembled their power plant from the ground up, even to digging the 6-foot supporting foundation and pouring concrete.

Not content to stop with the assembling project, the students, under the direction of Instructor H. N. Jenkins, put their engine to work as a means of studying power plant operation. It now supplies all power needed for day and night shop classes at this large educational facility. It runs fourteen hours a day with a 65-75 kw load. Together with other engines available, it is capable of putting out 400-kw.

Similar to the type used by many small rural communities today, the engine is considered by local school authorities to be excellent for purposes of practical applied instruction in the field. Every student enrolled in this class serves a 2-week training period in actual power plant operation. They take engine log readings every half hour during class. Water and exhaust temperature readings are indicators of malfunctioning. Electrical meter readings, by formula conversion, are used to compute kilowatts and horsepower. A record of fuel used is kept so that consumption can be computed on the basis of output.

The Hayward High adventure in practical diesel training is somewhat unique. Here students are actually trained as apprentice diesel operators and mechanics, qualified upon graduation to secure positions in various phases of the diesel industry. Such practical training should be considered by other schools to supplement "text-book" courses.

Related to the industry in general, cooperation on such a project as a means of training skilled diesel men, would certainly be a worthy public relations job. Moreover, it would help build a reserve of trained diesel personnel.

Electro-Motive Division turbocharges

Turbocharging ups ratings in 567 Series across the board. New engines power two new locomotive series.

SEVERAL important developments are announced by the Electro-Motive Division of General Motors Corp. Three new engines and two new series of locomotives have been formally introduced.

Importance of these new products lies in three major areas:

1. More horsepower and improved performance is made available in the same basic engine sizes for locomotive and other applications.

2. Economy is improved in two ways: (a) lower fuel consumption and (b) improved service life of engines, parts and locomotive components.

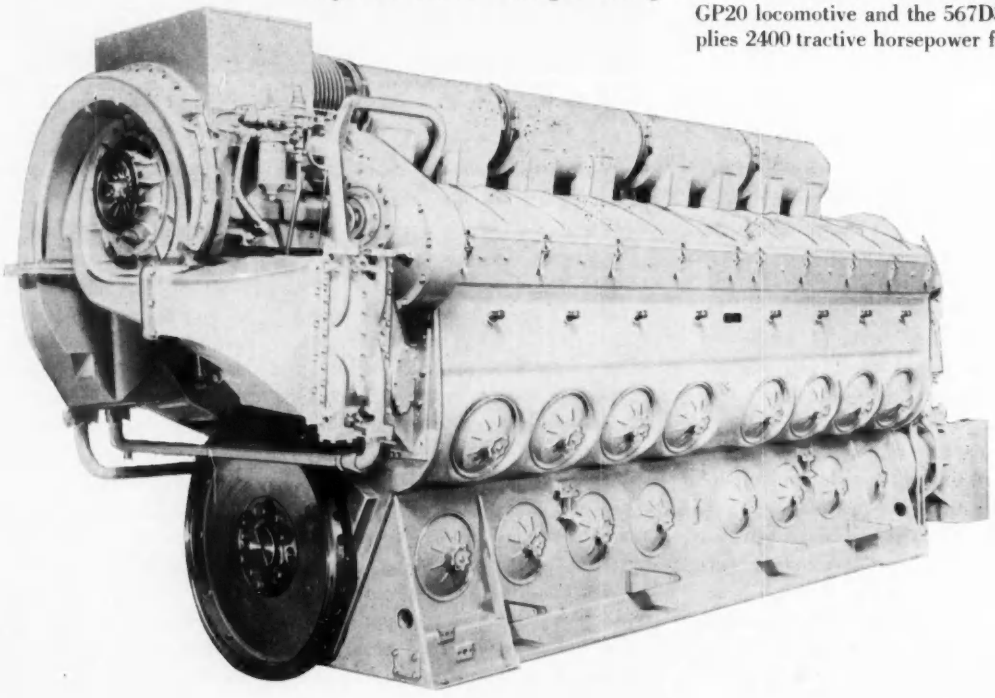
3. Maximum interchangability of engines, parts and locomotive components between earlier and new models has been retained to facilitate upgrading during overhaul or remanufacturer of earlier units.

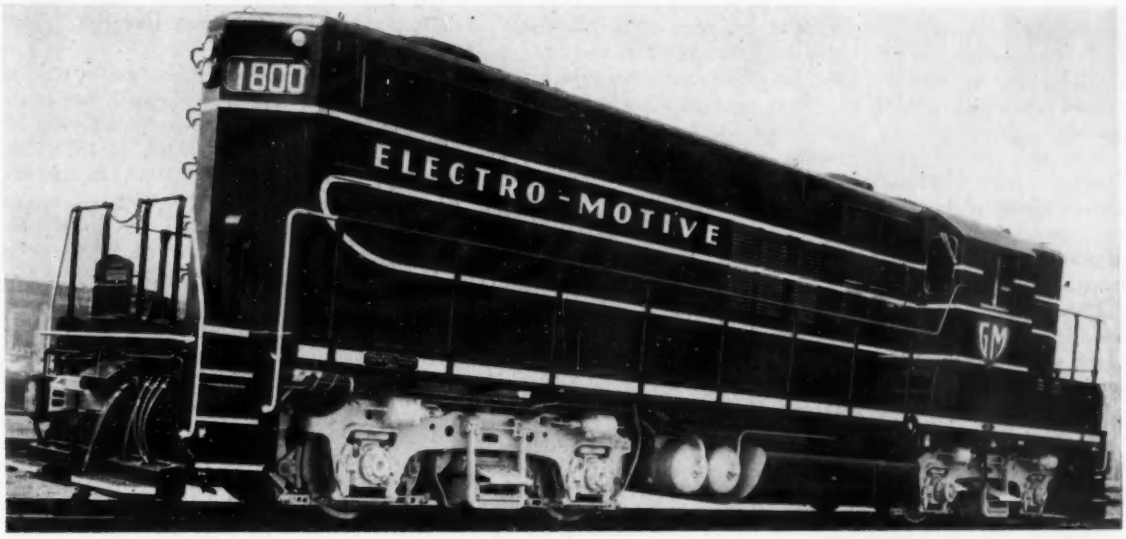
Three New Engines

Turbocharging is directly responsible for the increased horsepower of two new models and indirectly responsible for the higher rating of the third, a naturally-aspirated engine using a Roots-type blower. To accommodate the high outputs when turbocharged, improvements in structural and wearing parts were made.

The result is apparent in the first of the new engines, the naturally-aspirated 567D1. Taking advantage of greater strength and wear capability of the basic engine as designed for turbocharging, this model's compression ratio was boosted to 20 to 1. The result was a 5% improvement in specific fuel consumption at full load as compared to the 567C engine. Also, horsepower was increased from 1750 for the 567C to 1800 hp for application in the new General Purpose GP18 and Special Duty 5D18 locomotives.

The new 567D2 and 567D3 engines are both turbocharged. The turbocharger system designed and built by EMD will be discussed later. Engine ratings are different as they are used in different locomotives. The 567D2 provides 2000 tractive horsepower for the new 4-motor General Purpose GP20 locomotive and the 567D3 supplies 2400 tractive horsepower for the





Prototype of the new General Motors GP18 General Purpose Diesel.

new 6-motor Special Duty 5D24 locomotive.

Several modifications were made in the earlier 567 series engine to handle the increased mechanical and thermal loading resulting from turbocharging. The crankcase along with other structural members were strengthened. Main bearing caps were beefed up to withstand the higher mechanical loading.

A new sealing arrangement for the lower end of the liners incorporates a solid-type cylinder liner insert to reduce possibility of air leakage to the oil pan. Further protection is afforded by addition of a second lower liner air seal.

Reciprocating parts were reworked substantially. Starting right at the bottom, a new silver-backed connecting rod bearing is used. At the upper end of the rod the piston pin and carrier were completely redesigned with the higher loadings in mind. A removable bearing insert is now used.

Several piston modifications were made to handle the increased heat loads. Design changes for better cooling have reduced rim temperature by 17% compared to the earlier design. Temperatures in the ring area are also reduced.

Ring setup was changed for higher ring strength, better conformability and improved oil control. Four 3/16-in. compression rings are used, the top three being chrome plated. The oil ring is spring-loaded for higher wall tension and better oil control.

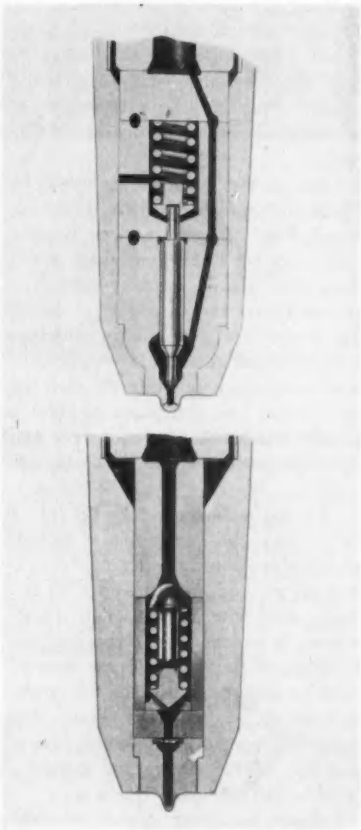
Cylinder heads and associated gear have been modified. The heads feature improved cooling. Valve train modifications start with new cam profiles for smoother exhaust valve action. Valve bounce is eliminated and stresses reduced on valves, springs, keepers and related parts. As more fuel must be delivered at the increased horsepower, injector rocker arms were strengthened.

New injectors are used, featuring spring-loaded differential-type nozzle tips. Characteristics of this type nozzle include sharper opening and cutoff. Experience with earlier injectors converted to incorporate this type of nozzle shows improved performance throughout the load range and substantial fuel savings at idling and part-load operation.

Valve-opening pressure has been raised from 1200 lb to approximately 3000 lb. This improves initial atomization. Seat location close to the spray tip reduces the fuel trapped between the seat and orifices and this plus sharp cutoff practically eliminates after-dribble. Spray tip contour has been changed to lower operating temperatures. Also, orifice length has been increased to give better atomization and spray pattern. Orifice size and number are unchanged. Earlier injectors can be modified to the new design.

Different capacity injectors are used in each of the three engine models in line with their outputs. One point concerning these new injectors

Cross-section photos show differences between spherical check valve injector (bottom) and new needle-valve injector. New valve provides opening pressure double that of old type.



is that they will emphasize the need for calibration and matching of all injectors in an engine. This has proven beneficial even with the earlier types.

Fuel and lube oil systems received attention. Both systems feature improved filtration. In the lube oil system, pump capacity has been increased for greater flow to improve bearing and piston cooling.

Engine governors have been modified. They now include a feature that limits fuel input to limit smoke during acceleration.

These are the principal modifications applying to all three engine models. Of course, turbocharging required more.

Turbocharging the 567D

Like all 2-cycle engine builders, Electro-Motive faced the turbocharging problem of low exhaust gas energy at low engine speed, low load and during starting. In the majority of cases this has been solved by use of a rotary blower and turbocharger in series. One natural-gas angle compressor uses the principle of engine drive of the turbocharger rotor when exhaust gas energy is insufficient to provide enough engine air. An overrunning clutch permits the turbine to take over when the energy level is sufficient. Thus the engine is assured of adequate air under all operating conditions.

This is the principle selected by EMD and applied to their diesel engine. The turbocharger — designed and built by EMD—provides for a drive from the engine gear train. The engine drives the turbo rotor, hence the compressor, until the exhaust gas energy is sufficient to drive the turbine faster than possible through the gear train. An over-running clutch permits the turbine to take over and thus relieve the engine of any blower load.

The turbocharger consists of a single rotor shaft on which is mounted the aluminum impeller of the centrifugal air compressor and a single-stage, axial-flow turbine wheel. Functioning is normal for turbocharging as long as the exhaust gas energy level is adequate to provide the necessary weight of engine air. Below this point the over-running clutch engages and the engine drives the rotor to provide the necessary intake air.

Exhaust manifolding was modified to meet the requirements of the turbocharger. In the 2400-hp 567D3, an aftercooler was placed in the air discharge elbow between the compressor and the airbox. The aftercooler lowers the temperature and increases the density of the air but also adds to the cooling water's load. So for this engine, higher-capacity water circulating pumps are provided.

The effect of turbocharging these two models includes:

1. Higher horsepower
2. Sustained power with increases in altitude up to 8000 ft.
3. A 10% improvement in specific fuel consumption

Design Target—Lower Maintenance Costs

Fuel savings are always important and welcome, particularly on the railroads where fuel represents so large a percentage of total operating costs. The next significant area for cost reduction is in maintenance expenses.

In the design of the engine, the locomotives and all their components, longer service life was a definite objective. EMD engineers, feeling that they had achieved this in the new engines, made parallel developments in their two new series of locomotives.

New Locomotives Use the New Engines

Five new road locomotives are involved in the new Normally-Aspirated Series and Turbocharged Series. In the first series are the RS1325, the GP18 and the SD18. The second series includes the GP20 and the SD24. The SD24 was announced earlier (DIESEL POWER, January 1959) and is in production. The GP18, SD18 and GP20 will be available in November with the RS1325 scheduled for January, 1960 production.

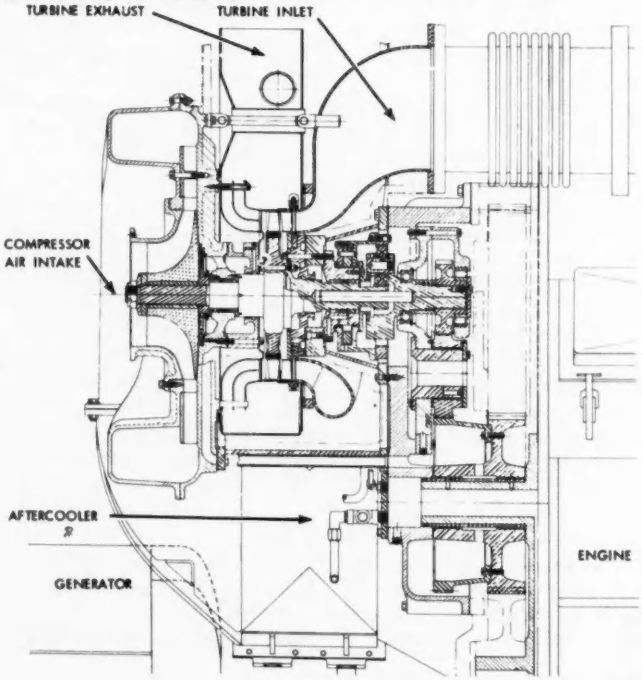
The Normally-Aspirated Series offers the railroads somewhat higher horsepower units with greater reliability and reduced maintenance. Estimates are that required scheduled maintenance can be reduced by as much as 60%. Also, life of major components has been extended.

In the Turbocharged Series, railroads have a means of operating trains at faster schedules or hauling present tonnages with fewer units. Improvement in engines and locomotive components also apply to these powerful units.

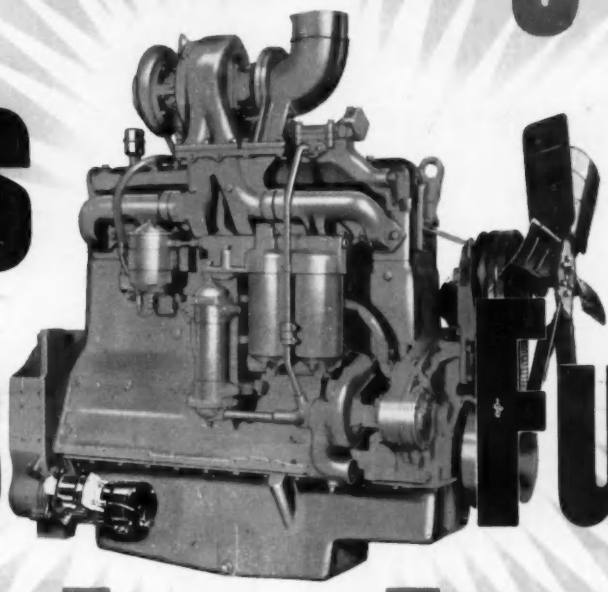
All improvements in locomotive components were designed with three objectives:

(*Continued on page 32*)

Turbocharger is engine driven through gear train when exhaust heat energy is not sufficient. (Starting, rapid acceleration and light load operation) At about two-thirds of full load, an overrunning clutch disengages and the engine exhaust drives the turbocharger. Aftercoolers are used on 2400-hp 567 D3 Model.



This New Engine Uses Less Fuel Than Any Engine In Its Class



The new Allis-Chalmers 21000 turbocharged diesel engine delivers 340 dynamic horsepower at 2000 rpm — and does it on only ¾ of a cup of fuel, or just .355 lb, — per bhp/hr.

The comparable engine with the next best fuel economy, by published claim, burns between .39 and .40 lb, or almost 10% more.

Another engine in this class burns, according to published claims of the manufacturer, .46 lb per bhp/hr — or 29% more. This means 3 extra gallons to every 10.

The Allis-Chalmers 21000 and companion 16000 (naturally aspirated) engines deliver superior performance because of superior, *advanced* engineering—at least two full years ahead. The famous Allis-Chalmers durability and lugability are still included, too — only more so. Let your nearby Allis-Chalmers dealer show you. Allis-Chalmers, Milwaukee 1, Wisconsin. BE-16

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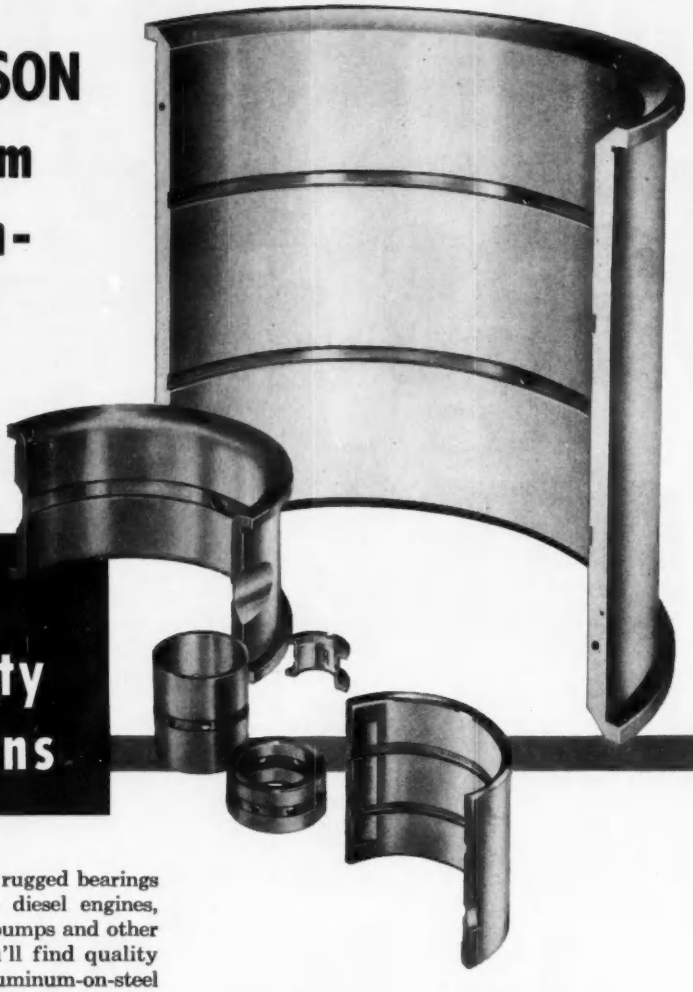

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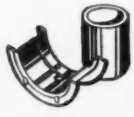
ALUMINUM ON STEEL SOLID ALUMINUM

BRONZE ON STEEL

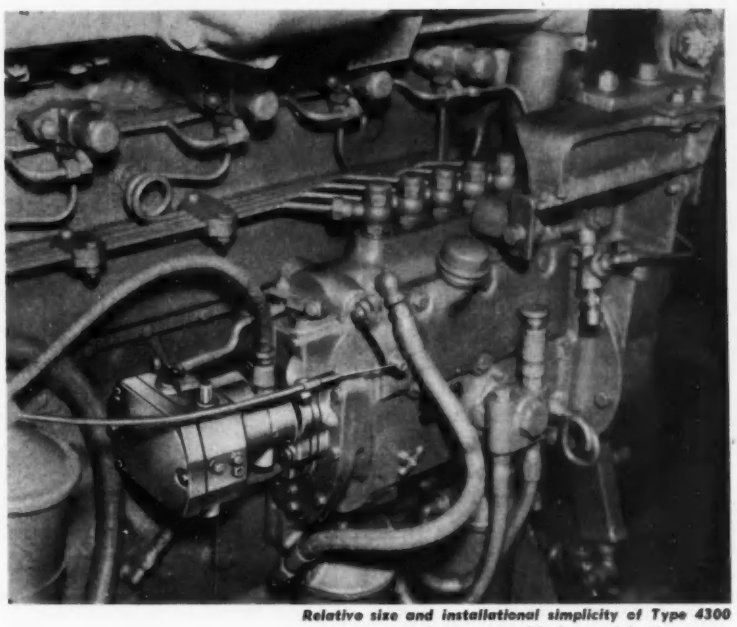


STEEL AND BABBITT

GRAPHITED BRONZE

BRONZE—CAST OR ROLLED

Farris Pickering speed-droop hydraulic governor



Relative size and installational simplicity of Type 4300 governor mounted on a multi-plunger injection pump.

CLOSE speed control is daily becoming more important for small generator sets. It has also been found that in variable speed and load applications, trucks for example, that close matching of fuel input to load demand has shown worthwhile fuel savings. Both requirements are within the capabilities of hydraulic governors and so there has been a trend toward their use. To meet the need, new small, simplified and compact governors have been developed.

One such unit is the Type 4300 speed-droop governor recently introduced by Farris Pickering Governor Company. Development combined high performance with a standarized product that still offers considerable applicational flexibility.

Performance includes fast response to either load change or throttle movement. This sensitivity is obtained with less than 2% speed droop. Steady-state stability is plus or minus ¼ of 1%. It has a speed range of 5 to 1 from 480 to 2400 rpm with a capability of being run at 3600 rpm. Work output is one foot-pound.

Construction Features

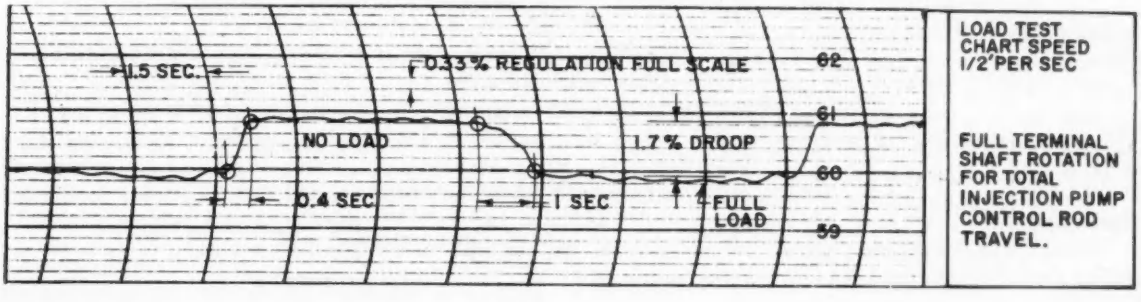
Housing (1) and general details of construction are standardized. However, considerable flexibility is still possible. For example, the governor can be mounted in any position from horizontal to vertical to best suit the drive and space requirements of the installation.

Characteristics of the speeder spring and its method of mounting permits this positioning flexibility. The spring is long to provide a 5 to 1 range but is guided at both top and bottom to eliminate possibility of misalignment. Position makes no difference and chatter as well as erratic action of the flyball head is prevented.

One-piece through-shaft construction is used for the throttle and terminal shafts. This results in accurate alignment, strength and a minimum of bearing wear and friction. Throttle and terminal shaft levers can be mounted on either side as the installation requires.

To meet specific governing requirements of an engine, different speeder springs and weights can be used.

Actual record of generator set performance on maximum load changes when using Type 4300 governor.



Also, variations in pilot valves and bushing porting are available to compensate for unusual conditions.

Another example of flexibility is found in the dual oil inlet. The governor uses engine oil as a power medium and the inlet to the gear pump can be from either of two threaded holes depending on the direction of flyball rotation.

There are several noteworthy constructional features in addition to those mentioned. As an example, the principle of one-piece construction was extended to the main pilot valve bushing. The driving spline and driving pump gear are machined in it. The ballhead is pressed on its upper end. This one-piece construction insures alignment and minimum friction and wear.

Flyweights are balanced precision castings. Toe-pieces are long to make immediate correction for minimum speed changes. Materials were selected for their wear characteristics as were the rest of the linkage parts.

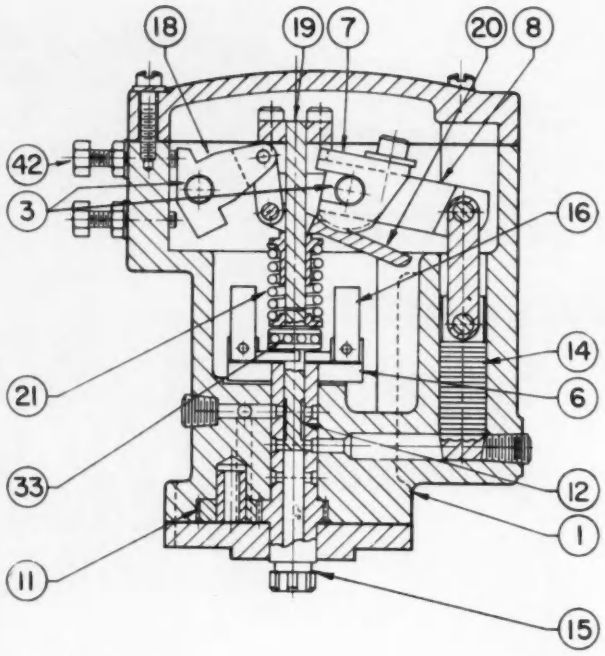
The pilot valve is precision-fitted in the bushing. Since the bushing is rotating, valve friction is at a minimum, making it extremely sensitive in controlling the pressurized oil.

Oil pump design is based on the special design used by Farris Pickering for over 20 years. Gear tooth undercut is eliminated, giving maximum displacement and minimum leakage per tooth. The relief valve is of simple 2-piece construction and generously proportioned to avoid possibility of clogging. Like the oil inlet, it can be moved from one side to the other to accommodate the direction of pump rotation.

Three external adjustments are provided. Low-speed (42) and high-speed stops are set to limit throttle shaft rotation. A smoke limit stop in the cover blocks upward movement of the servo piston when maximum desired fuel is being delivered. It is also possible to fit a motorized speed-changer for remote throttle settings in normal current applications.

Operation

Through the spline, the engine drives the pilot valve bushing (15) and thus the gear pump (11) and the ballhead (6). As speed increases, flyweights (16) move outward, lifting pilot valve (12) through the toe-weights. Pressure oil under servo piston (14) is then allowed to return to the sump via porting and a passage in the pilot valve.



A pull-back spring connected to the terminal shaft moves the servo piston downward, turning the terminal shaft (3) through terminal lever (8) in the direction to reduce fuel.

On a decrease in speed, flyweights move inward, lowering the pilot valve. This admits oil from the pressure pump to the servo piston, moving it upward and turning the terminal shaft in the direction of fuel increase.

Centrifugal force of the flyweights is opposed by speeder spring (21). Setting of throttle shaft (3) changes spring tension through speed adjusting lever (18), speed change link and floating lever (20). The upper spring seat is moved on guide shaft (19) which serves the additional function of limiting upward movement of the pilot valve. The lower end of the spring seats on the ball-type pilot valve bearing (33).

Positioning of the speed droop adjusting bracket (7) on the terminal lever determines the speed variation from no-load to full-load. The lower face of the bracket is contoured and is in contact with the floating lever. As the servo piston moves the terminal lever and attached bracket, the cam face moves the floating lever. This changes the speeder spring load and causes the flyweights to return to neutral position at a different speed.

Summary

Performance and applicational flexibility for both original and replacement installations, all in a light compact package, makes these governors very attractive. They can, and have been, used with different injection systems. For example, they have been used on GM Series 71 engines and mounted directly on multi-plunger type pumps.

These governors are sensitive and though the quoted maximum speed droop is 2%, production units are holding speeds to 1.5% using full throttle rotation and for 80% shaft rotation, a 1.09% droop. Simple in construction and easy to maintain, they fill a growing need for accurate speed control.

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Plymouth-Perkins Fleet Cab in Service

Super Operating Co. has had a diesel cab running for eight months. Here's what they have learned . . .

Fleet Operator Bob Scull told us "I'm a business man, not an engineer. Diesels to me are a tool with which I can cut operating costs.

EDITOR'S NOTE—This is the second article in a series on the dieselization of fleet taxis in New York City, the first appeared in our February 1959 issue (A Cab Fleet Owner Looks at Diesels). It offered a challenge to the diesel industry. This article shows what can be done in actual operation, points up the potential advantages of diesels in light vehicle application.

SUPER Operating Corp. of New York City has a fleet of 122 taxis, mostly new Fords. These cars run 21 out of every 24 hours when they are not down for servicing. They average 200 miles a day, burning up a gallon of gas every 10 to 11 miles in what is probably the most brutal stop-and-go traffic in the world.

Last October, Super added a 1957 Plymouth with a Perkins P4 diesel engine to its stable. After seven months, here is what this fleet operator has learned about diesel in this type of service.

"Its What's Up Front that Counts . . ."

This popular commercial line has double meaning in our story. First, it applies to good management; the planning and ability to change when the times demand it. Secondly, it applies to the diesel engine that continues to prove its economy and reliability in tough service.

"I'm a business man, not an engineer," Bob Scull, president of Super, told us. "As a fleet operator I'm interested in any practical advantage I can gain in running my business. You know what the economic situation has been. Operating costs keep rising. If the diesel could help bring these costs down and still allow me to give customers the kind of service they want—I was interested. And the only way I knew to find out was to put a diesel cab in service.

Borrowed From Belgium . . .

"It was on a European trip that I first became interested. Diesels are standard over there. In Belgium I saw some Perkins engines going into 1958 Chevrolets. These engines had come out of 1955 cabs that had already clocked over 135,000 miles. And the operator obviously expected them to give him a good many more miles in the new bodies.

"Now we figure that our engines have had it after from 80 to 100 thousand miles. We put that on in about 18 months. What if we could get half again, or possibly double engine life with diesels? The potential was there. When I got to England I made arrangements and flew up to Petersborough to see the Perkins engine people.

Day driver Sam Birnbaum said, "this is the best cab I ever drove. She is completely reliable and she gives me all the power I want when I want it."

"There were five things I wanted to know. First, economy. What could we realistically expect to save in fuel and maintenance? Second, we'd heard some objections to diesel fuel exhaust fumes and odor. Was this going to be a problem? Third, what about vibration? Four, would we get adequate horsepower in first and second speeds? Fifth and last, would our drivers accept the diesel?

"Some of these questions were answered by my visit to the Perkins factory. But there was only one way to get the others. I ordered a P4 engine to be installed in one of our cabs.

Perkin's Participates . . .

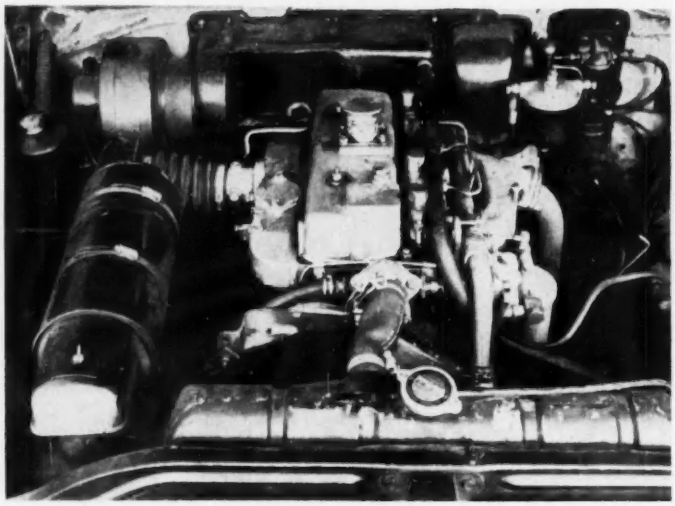
"The engine came down from Canada last September. Perkins sent two men down to supervise the conversion. It was done right here in our shop. That way our men gained some experience with the engine.

"Of course, we had some problems. This was something new we were trying. For one thing, we wanted to use the Plymouth's automatic transmission. We had to add some supporting members in the engine compartment to handle the additional weight of this sturdy, rugged engine. But by the first of October the cab went into service.

"Now, remember, this wasn't a factory job. We were learning as we went along. My mechanics hadn't any experience with diesel engines. We had to begin to *think* diesel. It would probably be a good idea to go into some of the problems we had in those first weeks of operation so that anyone following us can avoid some of our mistakes.

"First of all, we had the pump set up wrong and we were only getting about 14 miles to the gallon. We had a leak in the fuel line and were getting a strong odor in the interior of the cab. Also, we found that one of the injectors was not functioning properly. These were things that someone familiar with diesels might

Keeping the engine clean eliminated odor in the cab. Owner Scull learned the hard way—by experience. "We had to learn to think diesel."



A well engineered conversion. Note two stage air filtration, oil bath followed by dry type filter, necessary protection against city dirt.

have caught right from scratch. It took us two weeks to check them out and correct them.

"So, we learned that pump adjustment must be accurate. Injectors must be set up properly. These are both jobs which call for expert work and they bear heavily on the third thing we learned, that is you have to keep a diesel clean. As soon as we learned this, the odor we had noticed in the cab disappeared. After about two weeks we cleared up these problems and were getting 19 miles to the gallon and trouble-free operation. That means that we had almost doubled our mileage per gallon of fuel. We average between 10 and 11 mpg of gasoline. Since then we have upped the diesel mileage to approximately 21 miles per gallon.

Maintenance

At this point we asked Mr. Scull about his maintenance on both gasoline cabs and diesel. Here is his set up.

"Every 10 days the cabs are brought in for check-up. This means oil change, lubrication. filters, brakes; all the other quick-check points in this kind of a maintenance service stop. Every five weeks we do a major maintenance job. This means "the works". And of course, in the gasoline engine this involves the ignition oil and cooling systems —three big factors in maintenance in this business. It is important to note that ignition and cooling are not problems in the diesel.

"Our diesel gets the regular 10 day inspection and lubrication servicing and then the 5 week regular maintenance service. That's it. Other than that, she just runs. And incidentally, here she comes now."

The blue and yellow cab swung into the shop, the day driver, Sam Birnbaum at the wheel. Even in the big closed shop where noise is magnified, the Plymouth-Perkins seemed quiet. While she was being fueled, we talked with the driver.

"This is the best cab I ever drove," he told us. "She is completely reliable. I guess that's one reason why I don't find it as tiring as driving the standard cabs."

What About Customer Reaction?

"Once in awhile, someone from the country recognizes the distinctive sound of the diesel engine. But otherwise, I don't think anyone knows what's under that hood. If they do, they don't mention it," Birnbaum said.

Then we wanted to know about power.

"All I want. We aren't in any race. This cab will give me all the power I want when I want it."

What about smoke and odor, and vibration?

What's On The Meter

Now let's add things up. Super's diesel is giving them double the mileage over gasoline-fueled cabs. Maintenance costs figure to be at least 25% less. And this is a conservative figure based on the seven-month test period of operation. The saving in this area, as more fleets build an experience record, will undoubtedly increase.

They Are Playing Our Song . . . .

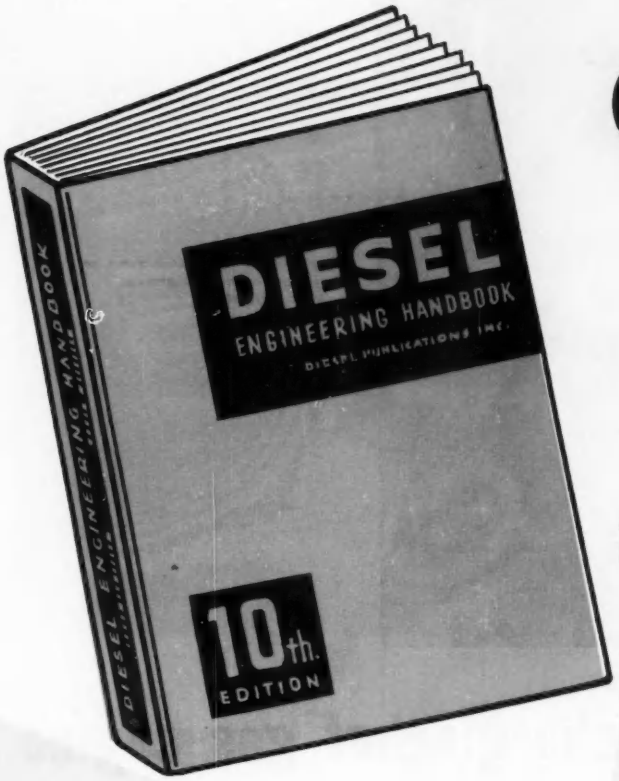
What is the immediate future? In April, several New York City fleets will take delivery of commercially-converted Plymouth-Perkins cabs. More and more private operators are using various diesel models and are piling up a record of performance that looks exceptionally good. It seems that the swing to diesel in this light vehicle application which we have advocated for so long, is really gaining momentum.

A number of factors are working to help it. For one thing, new taxes on fuel. Another, the proposed 10-cent *taxi-tax* which New York City is considering. As operational costs continue upwards, fleet owners must seek ways to economize. Diesels are the answer.

Here is the way one fleet owner feels. He tells us he's willing to bet that gasoline engines will be a rare thing in taxi service in New York City within three to five years.

Bob Scull answered this one. "We keep the engine clean and carefully adjusted. That takes care of the smoke and odor. There isn't any. The vibration problem doesn't exist either. When the engine was installed, rubber dampers were put in and they do a good job.

"As you can see this driver is happy with the cab. So is the night man. As a matter of fact we found that any of our teams would take the diesel. It was giving us a bonus we hadn't counted on in reliability. Trouble-free operation really means something in this business."



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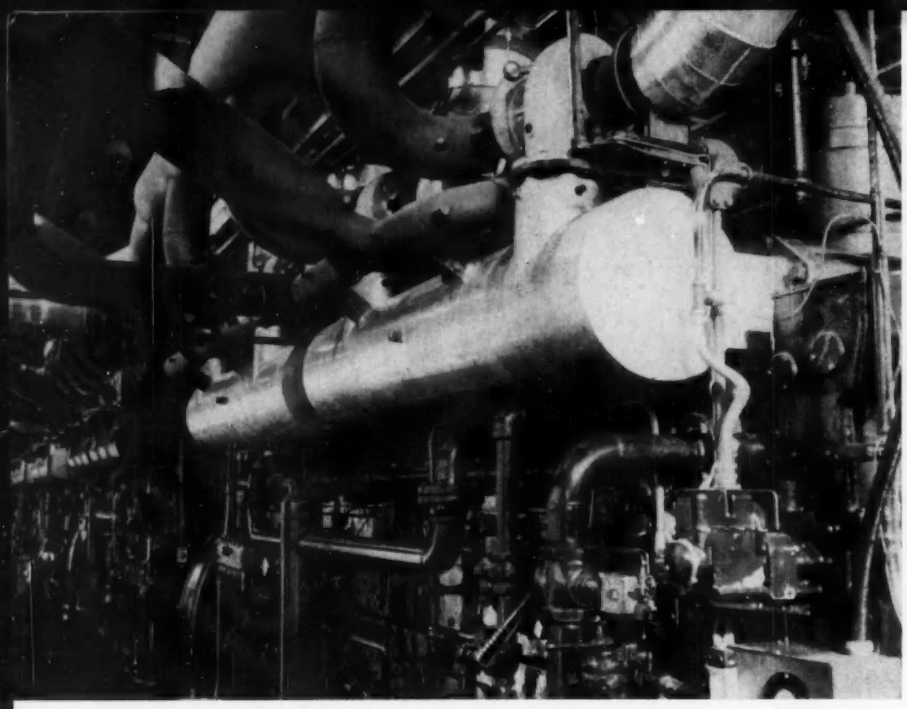


Four AiResearch turbochargers on Clark gas engine compressor unit in Richfield's Bakersfield facility.

Multiple turbocharging of gas engine

Last year Diesel Power reported on test use of multiple turbochargers on gas engine compressors in the February, June and July issues. Results of these tests have led to some 30 conversions at Richfield Oil Corporation's California facilities. Here is the follow-up report . . .

RICHFIELD Oil is adding nearly 9000-hp to its gas compression facilities in Bakersfield and Cuyama Valley. AiResearch turbochargers are doing the job through a method of applying multiple production units to each Clark engine.

Maintenance Simplified

As important as the boost in power is, it is only a part of this story. Through the use of small, high production turbochargers several other prime advantages are gained. Accessibility and ease of handling multiple, small units simplifies routine maintenance. The economic feasibility of having a spare unit and the minimum requirements of spare parts stock is another asset. It is a good way to hedge your bet where downtime cannot be tolerated.

Operation "power-boost" . . .

Powered by exhaust gas energy, the turbochargers move an abundance of high-density, cooled air into the engine cylinders. Thus, more fuel can be burned completely, giving the increase in power, and reducing specific fuel consumption. Components that do all this are shown in the photographs.

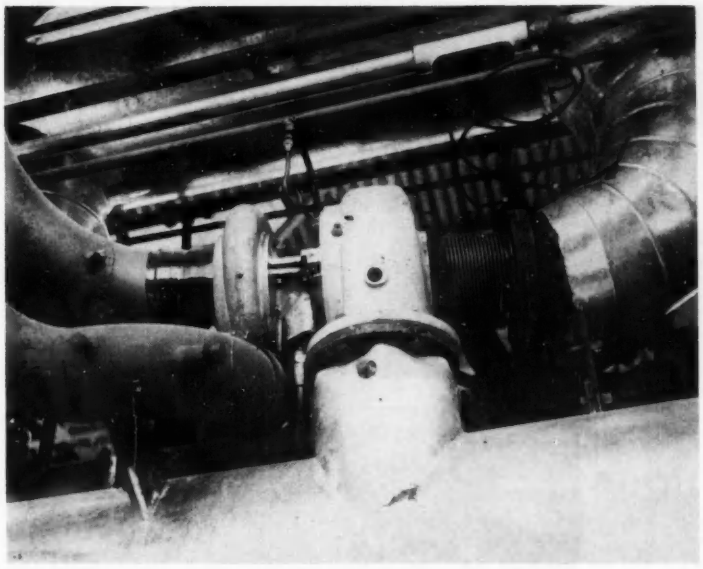
Basically, this is the operation. For a more detailed run-down on the installation and related problems refer to the articles in the 1958 June and July issue of DIESEL POWER.

Early tests paved the way for this current work. Engineers from both AirResearch and Richfield working jointly, have accomplished an extremely thorough installation. Richfield designed and fabricated appropriate exhaust manifold and intake ducting systems. Naturally, potential compressor capacities as well as the strength of the basic engine structure were carefully considered when determining the allowable power boost.

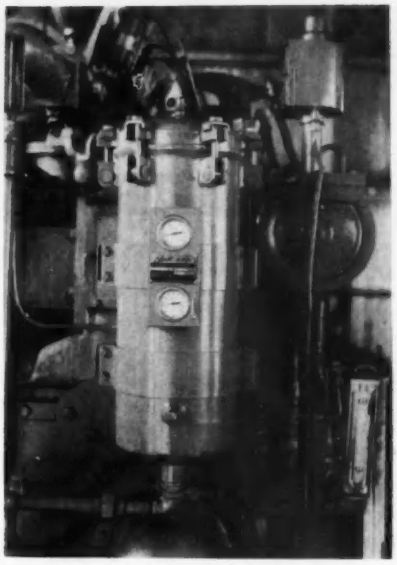
Components of the installation include a prelube pump to provide a supply of oil to the engine and turbocharger during starting and when cooling off after shutdown. Five-micron oil filters insure that clean lube reaches the aluminum engine and turbocharger bearings.

A new air-filtering system was installed with adequate capacity for handling the increased air flow.

AiResearch model T3011 units are being applied. Clark models include RA-6s, MRA-6s, HRS-6s, HSRA-6s, all 6-cyl engines employing 4 turbochargers each. The MA-8s, 8-cyl units use two turbochargers each and RA-32s, 3-cyl units, two each. An exception was made on the Clark MA-2, 2-



Closeup of production turbocharger installation. Lower manifold directs exhaust gas to turbine wheel. Gas vents to right. Ambient air reaches turbocharger compressor wheel through upper ducting on left.

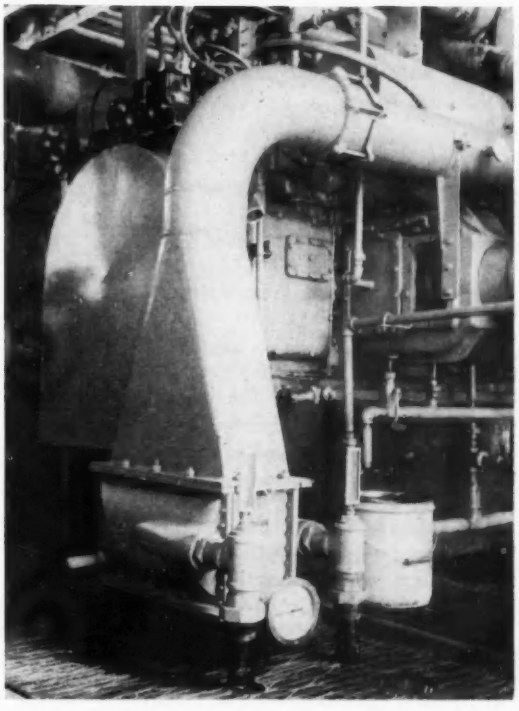


Five-micron oil filter provides clean lubrication for turbocharger. Engine has larger five-micron filter.

compressor units

cyl engine which is operated with a single AiResearch Model T14 turbocharger.

AiResearch intercooler decreases temperature and increases density of air from turbochargers on way to intake manifold of gas engine.



Results

The boost in gas engine output through the application of these small, high-production turbochargers is a healthy 25 to 35%. It is an efficient and economic operation, pumping natural gas from wells and plants around the clock every day of the year.

No additional space or building has been required to gain this increase in power. Additionally, there is a saving in maintenance and parts. Noise level has been reduced. These positive advantages of Richfield's installation should be intriguing to the natural gas industry across the board.

Section of the new floor space where extremely close tolerance work is required under controlled temperature.

Portion of the pump assembly line, showing assembly of Model D mechanical governor type pump.

ROOSAMASTER production facilities expanded

EVERY year since 1952, Hartford Machine Screw Company has had to increase production of its RoosaMaster fuel injection pump to meet increasing demand. The company, which entered this field some 12 years ago, has now had to expand its facilities to keep pace with today's needs and those anticipated in the future.

In 1948 the firm moved into its 275,000 sq-ft modern plant in Windsor, a suburb of Hartford. Recently, an additional 30,000 sq-ft was added, 22,500 sq-ft of which is manufacturing space, and 7500 sq-ft of administrative area. Over 300 people now devote full time to pump production, and many others of the more than 1000 people employed, work on pump parts and assemblies.

With well over 100,000 RoosaMaster pumps in service, Hartford Machine Screw Company feels that the field of applications for diesel engines is expanding year by year. The market potential for fuel injection pumps appears to be unlimited.

EMD Turbocharges . . .

(*Continued from page* 20)

1. Longer service life
2. Reduced maintenance
3. Application to earlier models when upgrading

For example, the new D22 main generators have an estimated life of 10 years compared to six years for the D12 unit.

Insulation and processing improvements are largely responsible for this higher life expectancy. The "hot-pressed" process used in the D47 traction motors is now used on armature and stator coils. This provides better heat transfer and longer coil life. Insulation of the stator with Class F epoxy resin and Class H silicone rubber reduces operating temperature even at the increased ratings.

A new electrical cabinet features electro-magnetic controls, replacing the pneumatic type with all their required maintenance. The cabinet-cleaning chore is eliminated since the new enclosure can be sealed to prevent entry of dirt.

Traction motors have a new suspension bearing, axle cap and wick lubricator. Weekly inspections can now safely be stretched to once a month.

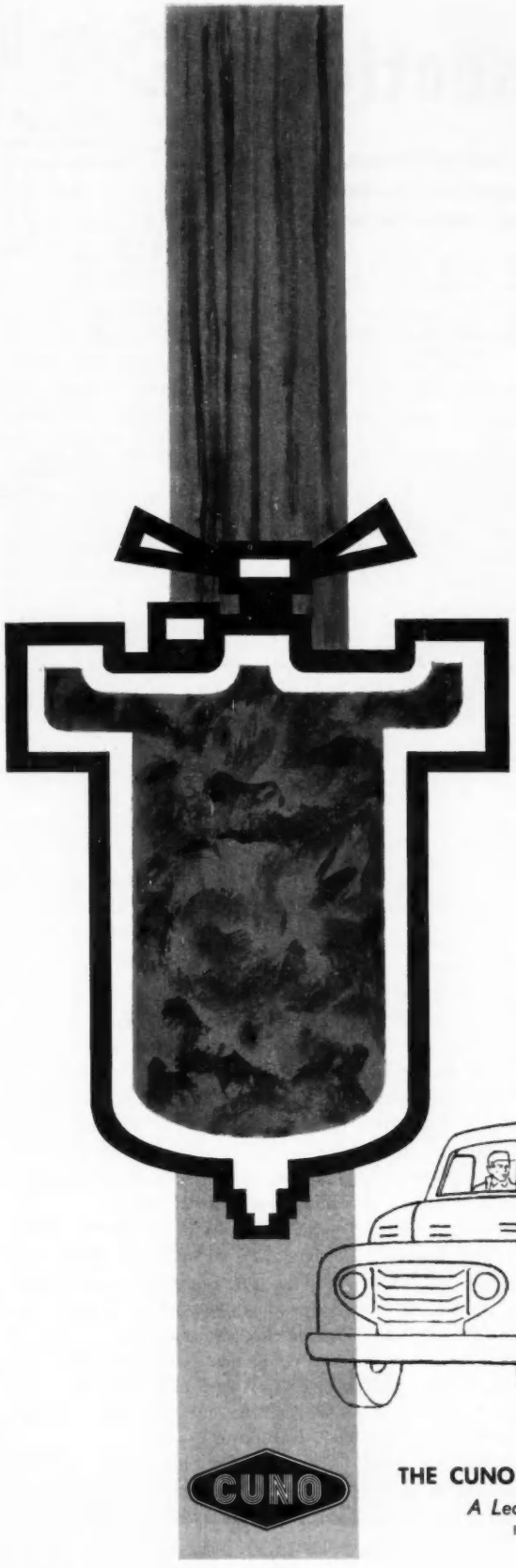
A new wheel-slip control protects traction motors from overspeed damage. Protection is provided for low-speed slip and creep control as well as high-speed wheel slips. The new control uses 50% static equipment and does not add complications in either equipment or circuitry.

These highlights indicate the extent of the changes. Of course, they only touch on all the refinements aimed at providing a long-life, minimum-maintenance integrated "package".

Conclusion

EMD engineers have certainly been busy to be able to release such a comprehensive package for the railroads all at one time. Even this isn't the whole story. Remanufacture is going on at a healthy rate and another —and promising—phase of their business is moving along.

Prototype experience in actual service is being gained by their completely-automatic 6000-kw, 4-unit electrical power plants. Three of the 567D3 engines supply necessary prime-mover power. Interest of the utilities in such equipment for low-cost peaking service is growing and should result in a good market for such equipment before too long.



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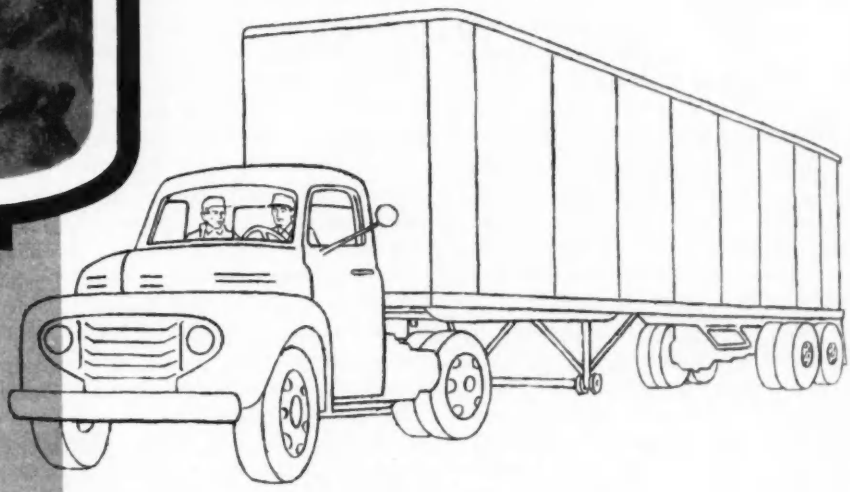

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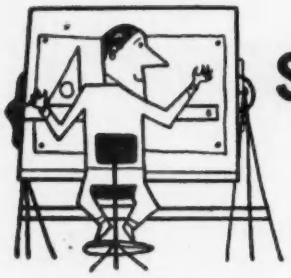


service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

Steel-Asbestos Head Gaskets for Cummins NHS and NHRS Engines

Steel-asbestos cylinder head gasket, Part No. 20666-2, has been replaced for use on Cummins NHS and NHRS engines making it applicable to all H and NH series engines. The change was effective on production engines starting with serial No. 129537.

Testing of the 20666-2 gasket has shown that it will give better performance on NHS and NHRS engines than other gaskets which it supersedes. Follow this procedure to install gasket and tighten cylinder head stud nuts.

1. Install gasket over the cylinder head studs, and lubricate stud threads with SAE No. 40 lubricating oil
2. Assemble the head stud nuts and tighten to 25-lb ft in order shown, then advance to 225-275-lb ft.
3. Next tighten all nuts in same rotation to 350-400-lb ft
4. Then tighten to 430-450-lb ft following same order of rotation
5. Run engine until oil and water temperatures reach 140°F to 165°F, then retighten head stud nuts to 430-450-lb ft in rotation described
6. On new engines, retighten head stud nuts at initial inspection to 430-450-lb ft after oil and water temperatures have been brought up to 140°F to 165°F. On rebuilt engines, do this retightening at first oil change.

G. M. Recommendations For Lapping Blocks

Continued use of lapping blocks causes worn or low spots on their lapping surfaces. Devote some time each day to refinishing blocks, since quality of finished work is only as good as condition of blocks.

Use a good grade of recommended lapping powder and work blocks together alternating from time to time. For example, if there are three blocks, work numbers one and two together, then numbers two and three, and finish with numbers one and three. Continue this sequence until finish of each block is perfectly flat and free from imperfections.

High or low spots can be detected when a clean block is held under a strong light. Bright or exceptionally dark spots are indicative of uneven surfaces. An even surface has a solid dark grey color.

When blocks have been properly resurfaced, wash them in clean fuel oil and scrub with a bristle brush. Protect blocks against damage and dust by storing in a close fitting wood container.

New GM Series 110 Piston

A new piston for the G.M. Series 110 engine has been introduced. It has three compression ring grooves in place of former which had four. Width of top groove in new piston has been reduced to increase ring life. Narrower ring groove reduces clearance between sides of compression ring and piston.

In conjunction with the piston change, compression ring hardness has been changed. Revised ring has a single groove on its periphery, whereas earlier-design ring had two grooves.

New piston ring sets, standard and oversize, incorporating three compression rings, have been provided for servicing engines using new 3-groove piston. The 4-ring piston ring sets, standard and oversize, will be retained since a ring must be installed in bottom or fourth groove of former piston.

Cummins L and LR Conrods

L and LR conrods beginning with Cummins Engine Serial No. 164451 are being machined without rifle drilling between crankpin and piston pin bores. Lubrication to piston pin bushing is provided by a drilling and countersink through lug and wall at top of rod.

Drilled and undrilled conrods can be interchanged if weight specifications are maintained. Part number of the conrod has not been changed.

Cummins NVH (S) and VT-12 Tappet Guides

New-style valve and injector tappet guides are used in Cummins NVH (S) and Vt-12 engines built after Engine Serial No. 154887.

The new tappet guides are designed to eliminate alignment difficulties during assembly by replacing rectangular guide tip with round tip. O.D. of round-tipped guide is same as width of old guide tip and fits into tappet guide slot as before.

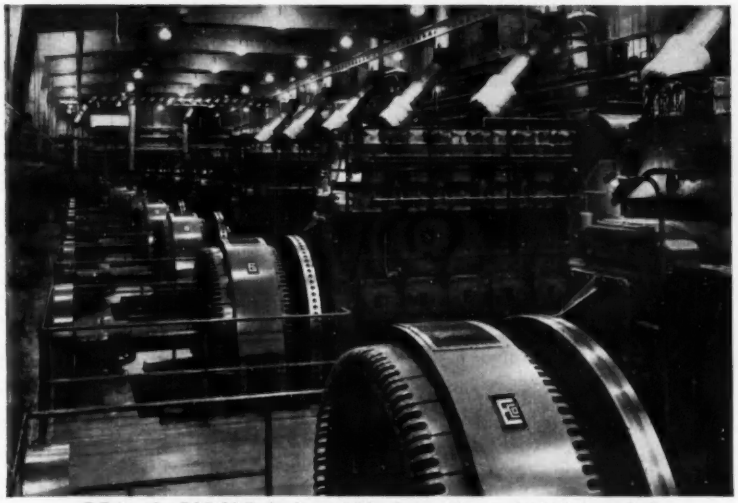
G.M. Engine Blower End Plate Assemblies Revised

The blower end plate assembly for blowers used with standard 3, 4, and 6-cyl G.M. Series 71 engines and in Series 110 model 62601RA, is no longer being serviced with rotor shaft oil seals as part of assembly.

Oil seals used in blowers for standard engine are different from seals used in turbocharged engines and Series E engines. Consequently, to standardize end plate assembly, separate components are available. Applicable oil seals will have to be installed in the end plate prior to build up of a blower assembly.

To service a blower for Series 71 and 110 models, rotor shaft oil seals and end plate must be ordered separately.

Behind Our Air Power And The SAGE System



7 Enterprise DSQ-38 Turbocharged Diesels provide completely independent power at "joint center" SAGE system power plant, McChord AFB, Wash.

...Electric Power by ENTERPRISE

This is one of the vital SAGE* system plants powered by Enterprise. In all, 25 Enterprise Engines provide some 44,000 HP, or 31,000 KW of power required to operate four of the complex SAGE network centers.

SAGE is the giant cyclops eye that will survey the skies far beyond our borders in a continuous search for aerial invaders. It's automatic. Electronic equipment can assemble and correlate information on air activity from a vast number of sources, describe the air situation, and direct interceptor aircraft and pilotless missiles to the target—all in a matter of seconds.

The need for totally dependable, uninterruptable electric power to operate computing and other equipment is obvious. Without it, SAGE just couldn't function. Our air defense system would be useless. That's why Enterprise Engines, both straight diesel and dual fuel types, have been installed in many of these critical centers. They meet rigid Air Force requirements—rewarding testimony to their real value.

No power plant should settle for less than Enterprise quality, long the choice of power experts. Get full information on models from 73 to 7703 HP in diesel, dual fuel, tri-fuel and spark ignited gas engines.

*Semi-Automatic Ground Environment

DEPENDABLE ENGINES

ENTERPRISE
engine & machinery co.

Subsidiary of General Metals Corporation
18th and Florida Streets, San Francisco 10, California

Boston • Chicago • Jacksonville • Kansas City • Los Angeles • Minneapolis • New Orleans • New York • Pittsburgh • Seattle • St. Louis • Washington, D.C.

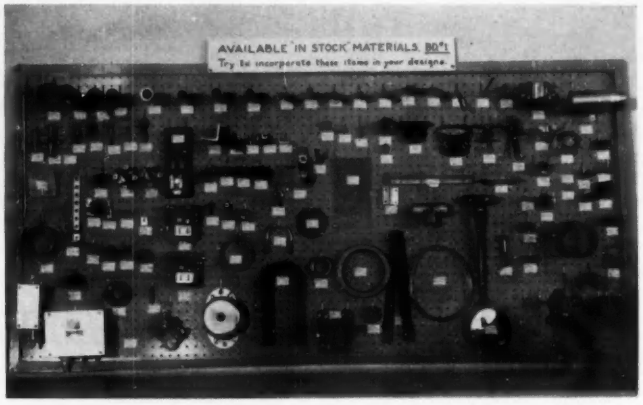
Diesel Logger Goes in Snow

Diesel power helps keep logging operations going in spite of heavy snowfall. This is the rugged timber country southwest of Alberton, Montana. A GM 6-71 diesel in this model TL6 Washington Trakloader, working through a torque converter, supplies reliable, hard-working power. The unit is skidding logs 900 feet up the mountain from this narrow roadway to an all-weather road where trucks are waiting to haul the logs to the mill. Contractor on the job is the Helean Logging Company of Missoula, Montana. Production is ranging from 20,000 to 40,000 board feet per day.

industry news

Dead Surplus Problem Solved

Engineers at Continental Diesel Electric Corp. have worked out a solution to the problem of surplus items which might be incorporated in new designs. This trick, of mounting the items in stock on a board where design personnel see them often, might work in your shop. Additional incentive is provided by a series of monthly "use-stock-items-in-your-designs" contests. Results: savings in invested money and storage, and an increase in efficiency of operation.



Caterpillar's 1000th Service Training School Grad

Ralph Bowers of Halifax, N.S. receives a set of micrometer depth gauges as the 1000th graduate of a Caterpillar service training school for Dealer Personnel. School is part of Caterpillar's six-course program to help provide expertly trained Dealer Servicemen. Shown with Bowers, from left to right, Caterpillar Service Manager D. R. Lammers; V. A. Woodling, Service Training Manager; Don Herring, service instructor; Dean Uhl, Service Manager for Caterpillar Americas.

new products . Page 38
people and plants . . Page 44
new literature . . . . Page 48

AERA Toronto Convention Huge Success

"Biggest in our 37-year history" is the way Automotive Engine Rebuilders Association officials described their Toronto Convention when all the figures were in. Over 1200 delegates from practically every state and province in the United States and Canada plus some from Denmark and Venezuela also declared it to be successful.

Engine rebuilders attended the technical program, met with manufacturers, and learned a lot in the informal talks that are such an important part of conventions.

Election of officers was part of the business sessions. Here's the new slate.

President . . . F. C. Bradley, Jr., Connecticut Bearing Co., Inc., New Haven, Conn.

1st Vice President . . . Richard S. Love, Love Machine Co., Inc., Salt Lake City, Utah

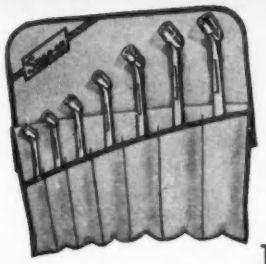
2nd Vice President . . . Ernest R. Sluggett, Detroit Cylinder Grinding Co., Detroit, Mich.

Treasurer . . . George W. Yount, Eagle Machine Co., Indianapolis, Ind.

Another important job was to try and fill the shoes of the late R. G. Patterson who had filled the position of Executive Vice President so capably for so many years. By unanimous decision of the Directors, James H. Templin, Motor Car Supply Co., Chicago, Ill. was selected. His background as Director and up to the Presidency plus his capabilities are ideal for the job. There's one catch, Jim has to run a business. He accepted the position with the clear understanding that he could devote only part time to AERA matters. He will point toward some future time when he can gradually relinquish his business reins to take over the AERA job fully.

(*More Industry News on Page* 43)

Snap-on® FLEX-HEAD WRENCHES —
SLIP into tight spots —
PIVOT for action



hand tools at their finest for the toughest jobs you have

FH-607-K
FLEX-HEAD SET

AVAILABLE ON CONVENIENT CREDIT TERMS

EACH socket of a *Snap-on* Flex-Head pivots through an arc of over 180 degrees — making it a handy wrench for reaching universal flange bolts, pan cap screws and similar jobs. The wrench swings over and under obstructions — handles hard-to-get-at nuts, studs, bolts. A friction spring holds the desired socket angle. With the handle in a vertical position, the nut can be spun rapidly. Flex the handle over and you have maximum leverage for tightening or breaking loose.

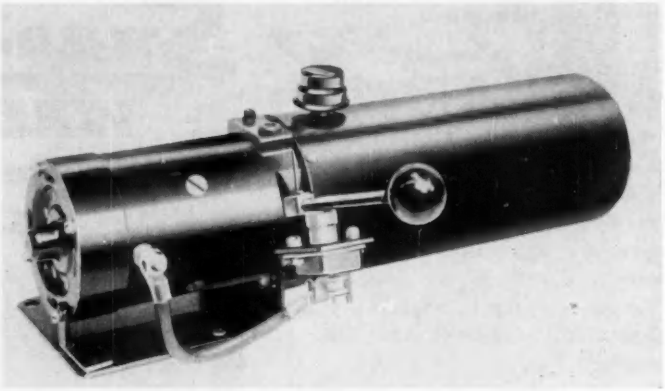
The *Snap-on* set illustrated provides all wrench sizes from 3/8 in. to 7/8 in., with the most widely used sizes duplicated on different handles.

Available from your *Snap-on* man or any *Snap-on* factory branch office. Write for general catalog "W" listing 4,000 *Snap-on* hand and bench tools.

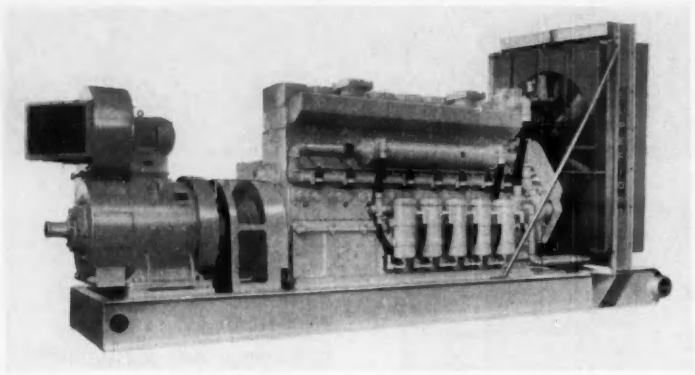
SNAP-ON TOOLS
CORPORATION
8064-F 28th Avenue • Kenosha, Wisconsin

New Hydraulic Power Unit

New fluid power source from John S. Barnes Corp. is this compact, dependable electric-powered pump for tractors, lift-trucks etc. Pump capacities are ½ to 4-gpm at 1800 rpm at pressures up to 2000 psi. This unit is of interest in light of current trend toward increased use of hydraulic-powered accessories by providing a power source independent of belting and engine power takeoffs.



new products

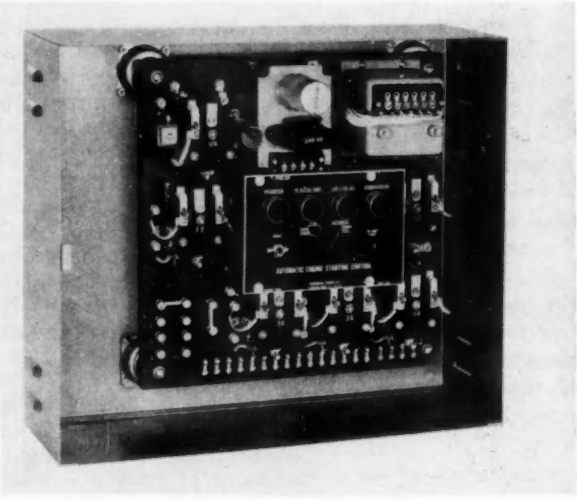


White "Drillectric" Oil Field Power Package

Pairing a Superior 8G-825 gas engine with a Westinghouse 371-A3 generator, White now has 263 power package combinations available in its "drillectric" line. New unit produces a continuous rating of 408-kw at 1020-amps and 400-v. "Drillectric" concept involves matching 12 White Superior gas, diesel or dual-fuel engines with two basic sizes of generators, various electric motors and tailored control components.

Automatic Engine Starting Control

ASCO's Automatic Engine Starting Control is for engine driven generating sets under the control of an on-off control device. It features positive prevention of recranking at full engine speed, ability to respond at 50% of normal battery voltage and repeated or continuous cranking-cycles. Construction details include industrial control-type components throughout. A synchronous motor-driven timer, powered by an inverter, assures constant cranking periods despite wide variations in battery voltage and ambient temperature. This timer can also provide one continuous cranking period adjustable from 5 to 75 seconds.



Industrial Power Units From Ford

Built around Ford's 330 cu in. 6-cyl diesel engine, new industrial power units are available from the Ford Division of the Ford Motor Co. These compact, durable units include sheet metal housing and instrument panel, electrical system, radiator assembly and skid type mounting. They come ready to go to work.

Ford points to two important user-benefits for the new line, which includes the "220" and "330" diesels —ready parts and service availability and many special attachments, such as transmissions, torque converters and use of SAE housings which permit customized installation in most cases.

Deltadyne Differential Pressure Indicator

A device primarily for use in aircraft hydraulic systems should have application in measuring pressure differentials across components of diesel hydraulic systems or those of diesel-powered equipment. The Deltadyne is a small unit activated by differential pressures as small as 5-psi in systems with internal pressures as high as 5000-psi. A red button is raised to view when a stated value is exceeded. Deltadyne can also be used to detect clogging of filters or excessive pressure drop in fluid systems. Looks worth investigating for use in our industry.

Direct Pressure Heavy-Duty Clutch Introduced

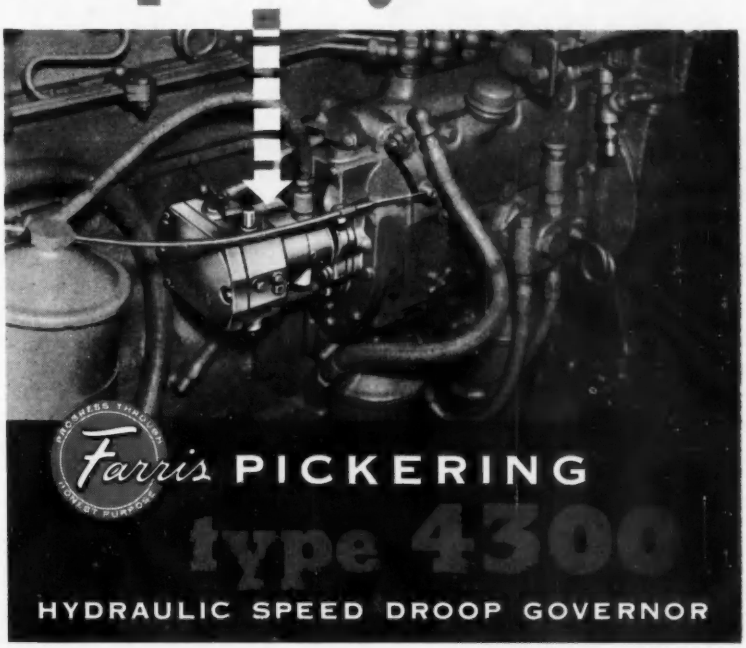
Designed to meet the requirements of heavy diesel on-highway vehicles, this new Lipe-Rollway 41 in. 2-plate DPB clutch is recommended for engines developing up to 735-ft lb gross torque. Its static torque rating is 1135-ft lb maximum.

This dry-disc, direct-pressure clutch has a facing area of 428-sq in. with unit pressure up to 26.5 psi. It is a rugged, light-weight unit which the manufacturer claims will give top mechanical efficiency due to friction free internal linkage. Drive mechanism is simplified assuring more perfect alignment between plate and engine flywheel—driving pin alignment is eliminated.

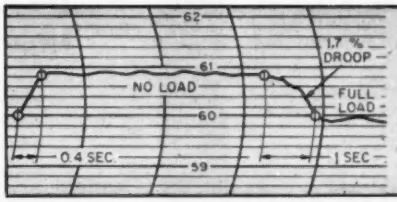
(*More New Products on next page*)

FUEL PUMP USERS—

Control Diesel Speed This Low Cost, Simple Way



Here is the economical, simplified way to control speed of diesel engine pump adaptations. A Type 4300 Farris Pickering governor can be mounted to your pump quickly and simply. No special tools are required . . . no adaptors are necessary. This economical speed droop governor uses ordinary engine lube oil as the pressure medium. Response to load change is immediate, with one-quarter of one percent steady state operation and less than 2% regulation! Use this lightweight, compact unit for many varied applications other than fuel pumps . . . such as generator sets, engine driven compressors, marine engines, trucks, tractors, hoists, bulldozers, arc welders.



Actual load test chart at left shows performance on Bosch type pump. Diesel generator is 3 cycle, 4 cyl., with 7½ KVA self-excited alternator. Note less than one-second response to load change.

SEND FOR BULLETIN FP-1217 for technical data and the name of your nearest distributor.

Precision Speed Controls Since 1862

Farris PICKERING GOVERNOR CO., INC.

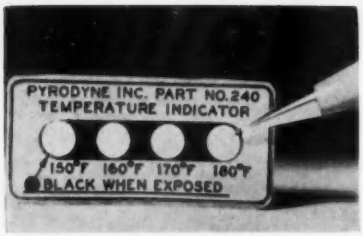
400 COMMERCIAL AVE., PALISADES PARK, N. J.

TEXAS PLANT: 5405 CLINTON DR., HOUSTON 20

AFFILIATES: Farris Engineering Corp. • Farris Flexible Valve Corp. • Farris Engineering Ltd., London, England

new products

Plastic Label Is Inexpensive Temperature Indicator



Temp-Plate is a small plastic label which gives a visual surface temperature indication. Backed with an adhesive the Temp-Plate is designed to adhere under a wide range of exposure conditions.

Temperature indications occur as sensitive white dots turn black. Temp-Plate is said to be accurate to within plus or minus 1 percent. It is available for indications from 100°F through 700°F in a choice of 50 increments. Made by Pyrodyne Inc. this interesting new product should have many applications in the diesel industry for simple, visual temperature indication.

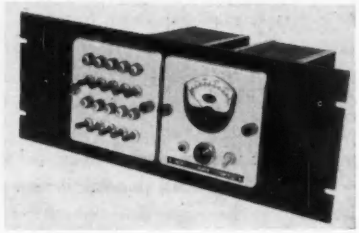
New Tool Eases Removal and Replacement of Snap Rings

Pesky problem of removing and replacing snap rings has been solved by new tool from Milbar. This versatile tool features replaceable straight or angle tips of various sizes. If you've ever busted finger nails or wasted valuable time in removing snap rings—you'll want this new tool.

New Power Machine for Hose Assembly

Parker has announced a new machine which speeds the assembly of reusable Hoze-lok fittings on industrial rubber, cotton-covered, wire or fabric-braided hose. Driven by a ½-hp, 60-cycle electric motor, the machine, called Model 422, readily handles hose ranging from ¼-in. to 1⅜-in. inside diameter. Should be of real interest in many shops.

Continuous Thermistor-Type Multi-Point Temperature Monitor System



Fenwal Inc. has just announced an advanced temperature monitoring system capable of monitoring a virtually unlimited number of points continuously. Using thermistor sensing devices, the unit is designed to detect and furnish warning when temperatures at protected points, such as bearings in generators, turbines or pumps reach a preselected high or low limit. It can be used for monitoring temperatures between −25°F and +600°F. This is a flexible, compact, simple to operate temperature monitor designed for reliability, stability and requiring a minimum of maintenance.

INSTANT START, NO BATTERIES WITH I-R

AIR STARTING MOTORS!

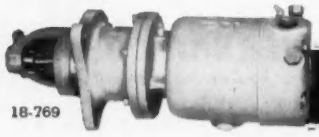
Dependable: Fast, positive starts regardless of temperature. Made by the originators of Air Starting Motors.

Low cost: Eliminates batteries, generators, electrical parts and their maintenance.

Less weight: I-R Air Starting Motor installations weigh less than conventional batteries and generators . . .

Three sizes: I-R Air Starting Motors are made in models to meet the needs of almost all stationary, auxiliary and motive engines.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.



Write for new Air Starting bulletin Form 5094D.

18-769

MAINTENANCE MINDER

X-RAYS YOUR AIR CLEANERS

. . . TELLS EXACTLY WHEN FILTERS NEED TO BE CLEANED OR CHANGED

Dust, dirt and airborne abrasive particles can wreck an expensive engine, or cause excessive fuel consumption and loss of power. Checking your air cleaners regularly with Maintenance Minder assures you they are doing their job efficiently . . . tells you when to service them. Atmospheric conditions change, causing the amount of airborne particles to change. Periodic checks could be too late. Avoid down time and engine damage. Put Maintenance Minder to work today as your "Watchdog". Only $19.75

Maintenance Minder, Dept. DP-2
5425 Second Ave., Des Moines, Iowa

Dual Front Wheel Assembly Developed

Truck Equipment Company has completed tests, in cooperation with Gallagher Freight Lines, on a dual front wheel assembly which they claim will permit front axles to carry 18,000 pounds or more and will increase tire mileage better than 50%.

Dual front wheels make long vehicles easier to maneuver with their 30% greater turning angle. Greater protection against blowouts and loss of control are inherent in this assembly. Front tires and wheels are interchangeable with rear tires and wheels. Parts are interchangeable with standard units now in service.

The four front tires are mounted on standard wheel bearings and are mounted so that each wheel rolls independently. Advantages of this axle assembly are increase in payload, additional "cube" capacity and better frontend stability. This means improved driver comfort and reduced fatigue on long pulls.

Truco axle assembly is adaptable to all types of truck operation and truck design including all diesels.

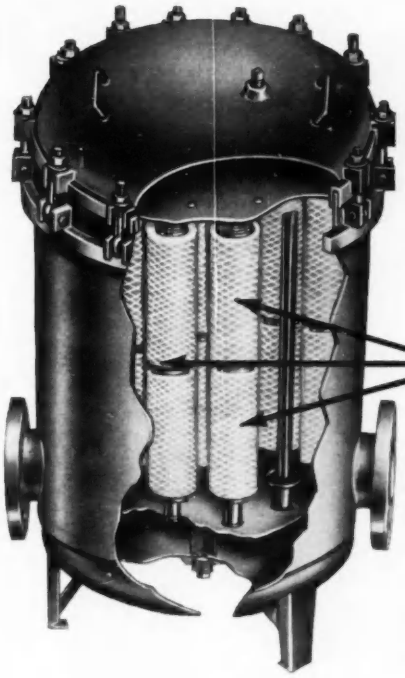
Recorder Checks Time, Speed and Mileage to Cut Costs

Fleet owners and truck operators can cut costs, improve operations through the use of Servis Speed Recorder. This instrument, manufactured by Service Recorder Co., provides a chart record of idle time, travel time, speed in mph or rpm and mileage. Data is automatically logged on 6-in. circular charts.

The unit is driven off the back of the speedometer or tachometer. It can also include a push-button box which can be set at predetermined speeds. A red light indicates excessive speed. On the rpm model two lights provide warning, a red light when rpm is too low and an amber light when it is too high. Glowing light also indicates time to shift.

Self-Locking Retaining Rings

Available from Ramsey are retaining rings that automatically lock when centrifugal force is applied. Called Spirolox Rings, they are specially designed for high rotative speed applications, or where dirt or sludge tend to force ordinary rings out of the groove. No special tools are required to install or remove Spirolox, nor is counterboring required. Light and compact, they have a full 360 deg bearing surface.



It's what's inside that counts

in lube and fuel filters

Patented Honeycomb Filter Tubes, the heart of every Fulflo Filter, are your safeguard against excess engine wear and maintenance.

You get true *depth* filtration — through hundreds of filtering tunnels engineered for uniformity of size, shape and depth. You get the exact degree of microclarity you want — through positively controlled densities. You get *positive* protection — no by-passing, rupturing or channelling. Furthermore, you get unequalled tube life.

For true depth filtration, insist on Honeycomb Filter Tubes and Fulflo Filters. You can also rely on CFC elements and filters for by-pass filtration and for removal of soluble as well as solid contaminants.

Write for literature to Department DR.

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE MASSACHUSETTS AND LEBANON, INDIANA

PREPARING our April Engine Specifications section is an exacting task. Much of the information reaches us late and we usually end up in a last minute rush to get this service to the industry on press, on time. Mistakes in this type of operation are inevitable. When they occur we publish corrections, as in the case of the listing below. Clip this corrected copy and paste it over the entry in the specifications.

F. Perkins (Canada) Limited, 60 Wingold Avenue, Toronto 19, Ontario Canada

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Hp.	R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
P3/144	A	M-S-P	4	3	3½ x 5	32.7-41	2-2400	C	....	E-H	....	C†	22	22	30	398
P4	A	S-P	4	4	3½ x 5	43.6-58.5	2-3000	C	....	E	....	....	26	23	29	494
P6	A	M-S-P	4	6	3½ x 5	65.4-88	2-3000	C	....	E	....	SC***	34	23	33	673
SIX/B305	A	M-P	4	6	3.6 x 5	89(1)	2600	C	....	E	....	SC	34	23	33	673
FOUR/270D	A	M-S-P	4	4	4¼ x 4¾	56.5-62	2000	C	....	E	....	SC†	32	22	31	680
SIX/340	A	P	4	6	4 x 4½	69-112	2-2850	C	....	E	....	....	39	24	35	914
S6	A	S-M	4	6	4¾ x 5	104.9(2)	2000	C	....	E	....	SC***	39	30	35	1100
FOUR/99	A	S-M-P	4	4	3 x 3½	34.8-43	3-4000	C	....	E	....	†	22	20	24	320

† *Parsons.* *** *Self Change.*
(1) Maximum vehicle rating (2) Continuous industrial rating.
Where a horsepower and rpm range is shown the low end is the continuous industrial rating to BS 649:1958, and the high and the maximum gross car, vehicle or tractor rating.

The World's Leading Manufacturers of
FUEL INJECTION EQUIPMENT
for Diesel Engines
Depots and Service Agents
in over 100 Countries
C.A.V.
FUEL INJECTION EQUIPMENT DIVISION
of
LUCAS ELECTRICAL SERVICES, INC.
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Sales Office: 14820 Detroit Avenue, Cleveland 7, Ohio
West Coast: 5025-29 W. Jefferson Blvd., Los Angeles 16, California
Branch Offices: 643 7th Street, San Francisco, California
4937 West Belmont Avenue, Chicago 41, Illinois
400 South Edgewood Avenue, Jacksonville, Florida
Canadian Distributors: Joseph Lucas (Canada) Ltd.
Head Office: 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Quebec
AP 935

industry news

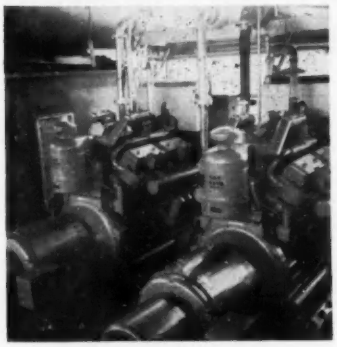
(*Continued from Page 37*)

Diesel Equipment Speeds Trinity Dam Construction

Trinity Dam contractors are moving and tamping some 33,000,000 cu yd of earth and rock into place to dam up the Trinity River near Lewiston, Cal. This is being accomplished with the use of vast numbers of GM diesel-powered vehicles, shovels, air compressors, generating sets, etc. Unique in the transportation of the fill is a 9000-ft conveyor belt which moves material down the side of the mountain to giant loading hoppers. From the hoppers it is transported to the dam in an almost endless procession of diesel-powered earthmoving vehicles.

One of the largest earth-fill dams ever undertaken, it is set for completion in 1962. Water of the Trinity River and other streams rushing down the mountain near Lewiston will be controlled and diverted by tunnel to irrigation and other uses in nearby Central Valley. Thus the winter's accumulation of snow and ice melting in spring will increase productivity of the land instead of being lost in the Pacific Ocean.

Waste Gas Goes To Work



Waste gas, normally piped away and burned, has been put to work at a gas separation station on Lake Maracaibo, Venezuela.

At the Superior Oil Co. flow station on the Lake, an oil and gas mixture from about 12 wells within a radius of five miles is piped under natural well pressure to a gas separation station. Gas is then separated from the crude and until now the bulk of it has been released to the atmosphere through two pipes extending 500 ft out into the lake.

However, four Caterpillar D375 spark-ignition engines now use the gas to drive four National Supply C-100 pumps. Two more Cat D375's drive a fifth C-100 pump, a 75-hp water pump and two 187-kva Electric Machinery generators.

Present capacity of the station is about 70,000 barrels per day. This will be increased to almost 100,000 barrels per day with addition of two more pumps, coupled to two more Cat D375 spark-ignition engines.

Mobile Power Plant Does Double Duty

Eastern Maine Electric Cooperative is putting their standby diesel-electric power plant to good use. It will both provide power for a new saw mill pending extension of power lines, and serve as emergency power source for the system. The 300-kw plant consists of a GM 450-hp model 8-268A diesel and a Westinghouse 300-kw, 375 kva generator complete with switch-gear and radiator, all housed as a full trailer unit. Construction of the packaged, mobile power plant was done by A. G. Schoonmaker Co. of Sausalito, California.

MAN "Whisper" Engines Power Tractors, Trucks for West Coast Sale

Three tractors and a truck, all powered by MAN's "Whisper" engine (M-System combustion chamber) recently made the trip from Germany to Los Angeles Harbor. They will be marketed by Wilbo Industries, a harbor-located firm. R. A. Moon, vice-president, Sales, states that the marketing area covers an 11-State area all in the West.

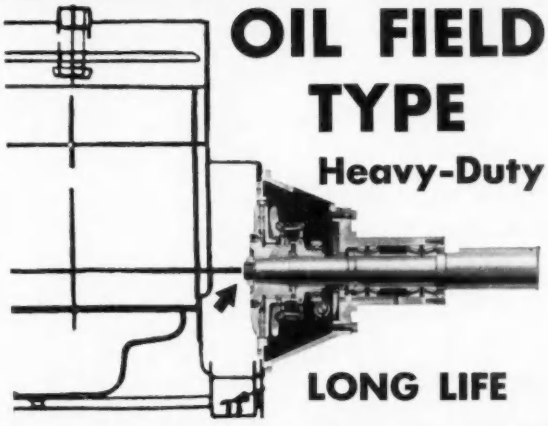
First imports feature a 2-cyl 14-hp air-cooled diesel; a 2-cyl 24 hp water-cooled model; and a 4-cyl 60-hp water-cooled version rigged to produce 4-wheel drive. The 23,000-lb GVW truck uses a 6-cyl engine. All have the M-Combustion system.

A similarly-powered bus is scheduled for later arrival, according to Moon, and will be tested by the Los Angeles city transit system. The "Whisper" engines quietness, a good fuel economy and multi-fuel capability are attractive.

ROCKFORD

OIL FIELD TYPE

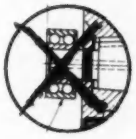
Heavy-Duty



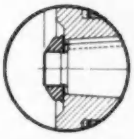
LONG LIFE

POWER TAKE-OFF

➡ Eliminates the Pilot Bearing



Eighty five percent of all take-off failures that are caused by misalignment, lack of lubrication, overload and other reasons—stem from the pilot bearing.



By eliminating the pilot bearing—in this new Oil Field type, long-life, extra heavy-duty power take-off—ROCKFORD has reduced down-time to a minimum. This improvement will help increase the trouble-free work-hours of *your* equipment.

BW SEND FOR THIS HANDY BULLETIN

Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

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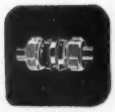
Heavy Duty Spring Loaded



Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

CLUTCHES

people and plants

August Sunnen

August Sunnen Succeeds His Late Father as General Manager

August Sunnen has been named to succeed his late father as General Manager of Sunnen Products Ltd. Since 1947 Mr. Sunnen has been a Director of Sunnen Products Co. Ltd. of Canada and Sunnen Products Co. in St. Louis. His employment with the company includes eight years with Sunnen St. Louis operation as Development Engineer, Plant Superintendent and General Sales Manager.

Addition to Cummins Sales Staff

Vernon Hill has been appointed to the sales staff of the Cummins Engine Co. He will specialize in the construction market, contacting manufacturers, contractors and other power users in the construction and mining fields. Mr. Hill has been associated with the construction and mining industries for some 13 years.

New Department at Sealed Power

A new department to be headed by Mr. William VanDam will be formed at Sealed Power Corporation. A change in Product Engineering will encompass the establishment of an application engineering department. This group of engineers will be responsible for adapting Sealed Power products to all customer and potential customer requirements.

August E. Peitzmann

Centrico Establishes Western Division

Mr. August E. Peitzmann was named Manager of the new Centrico Inc. Western Division which has been established to handle distribution of Westfalia Centrifugal Separators throughout eleven western states.

Mr. Peitzmann has had a broad background as a sales engineer and technical specialist on all types of Westfalia Separators as well as experience in the firm's main plant. His new headquarters will be in San Mateo, California.

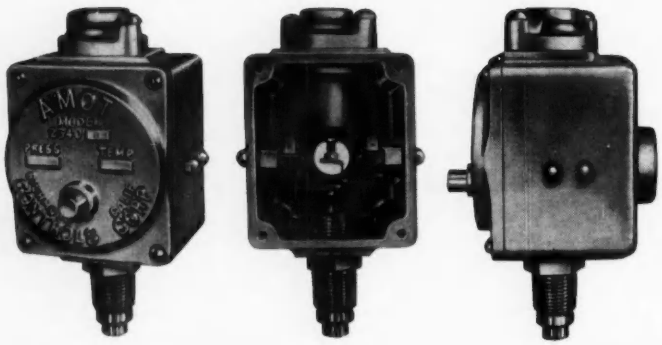
Hercules Appoints First Master Distributor in Yukon Territory

Ed Jacobs Motors of Whitehorse will handle and service Hercules complete line from its strategic location on the ALCAN Highway. Hercules has made this appointment in view of the fact that its new distributor has adequate experience, training and facilities for servicing trucks making the ALCAN run.

Diesel Equipment Company Begins Construction

Diesel Equipment Company, distributor of Detroit Diesel engines in Western Kansas, has begun construction on a new $100,000 building in Wichita. It will house complete sales, parts and servicing facilities. Details of the new building will include a unique overhead crane system for efficient handling within the shop and a special bay for accommodating engine servicing on large highway trucks.

★ SO MUCH PROTECTION AT SO LOW A COST!



The AMOT SAFETY CONTROL SWITCH, Model 2340, illustrated above, is of such high quality and priced so low, that it is suitable for the protection of all Diesels, from the low priced high production models to the largest and most expensive custom built engines. It protects engines against high jacket water temperature and low oil pressure. Model 2340 A, without reset button, is priced at only $30.00. Model 2340 B, illustrated, is $33.50. No where else can you get such positive protection for so long a time at such a low price. Write for Amot Bulletin No. 387.

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Carroll E. Dietle

New Post for Dietle at Nordberg

As part of their expansion of activities in all markets for diesel engines, Nordberg Manufacturing Co. has announced the creation of a new post that of General Sales Manager of the Engine Division. Mr. Carroll E. Dietle has been appointed to fill it. Mr. Dietle will be responsible for coordination of all diesel engines sales and for the introduction of additional sizes and types of engines to the trade.

Mr. Dietle, prior to joining Nordberg, was manager of the Diesel Division of Fairbanks Morse & Co.

Fairbanks-Morse New Diesel Division Manager

Sheldon K. Howard has been appointed as Diesel Division Manager at Fairbanks, Morse & Co. He has been Manager of the Diesel Department of the Fairbanks-Morse branch in Atlanta for the past eight years. Prior to that he was a diesel sales engineer in the Boston territory. He replaces Carroll E. Dietle who resigned and has since joined Nordberg Manufacturing Co.

Sheldon K. Howard

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The Model K-120 is the only maximum pressure indicator that can be used as a compression tester on small, high-speed engines and as a firing pressure indicator on engines having indicator valves. Patented Kiene diaphragm type check valve of stainless steel has no springs or piston, no complicated adjustments, temperature corrections or pressure loss. Bleeder valve permits release of indicator pressure for repeat readings. This instrument gives true pressure readings with an uncompensated gage.

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Adolph A. Karrasch

Karrasch Joins Hercules

Well known in the diesel industry, Mr. Adolph A. Karrasch has moved to Hercules Motors as Manufacturing Director. A veteran truck engine production engine man, Mr. Karrasch was previously employed by International Harvester Co. where he had served for many years.

New Manager of Engineering Records At Waukesha Motor Co.

Recently named Manager of Engineering Records at Waukesha, Mr. Wesley Klatt will direct the operations of the Specification Department, the preparation and release of new parts and components directives, standardization and interchangeability records, power curve data and engine specifications. Mr. Klatt joined Waukesha in 1929 and has been with the firm since.

Donald E. Beaton

Promotion at Twin Disc

Donald E. Beaton has been promoted to Director of Manufacturing for the Twin Disc Company's Hydraulic Division in Rockford, Illinois. Previously Mr. Beaton has been Assistant General Manager of the Twin Disc Hydraulic Division since 1952. Prior to that he was Factory Manager, of the Thompson Products Company's Accessories Division.

Flexonics Industrial Hose Division Has New Marketing Manager

Mr. Robinson F. Edgar is the new Marketing Manager of the Industrial Hose Division of Flexonics Corporation. Mr. Edgar has been with the Warner Electric Brake and Clutch Co. of Beloit for the past 12 years, his last position there being General Sales Manager of their Industrial Division. He will make his new headquarters at Rock Falls, Illinois.

NEXT MONTH

DIESEL POWER

Tool and Maintenance issue

. . . plus an exciting change in format designed for easier reading.

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Leading Manufacturer in New York area seeks experienced SERVICE MANAGER, *Qualifications:* technical knowledge of fuel injection and automotive electrical products, experience with service procedures in this field, organizing and leadership capabilities. Application to Box #B6-592, c/o Diesel Power, 80 Lincoln Ave., Stamford, Conn.

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new literature

Inco Nickel Topics Reports On Ni-Resist Cast Iron

Looking for metals to solve high temperature, corrosion and wear problems? You'll find the latest edition of International Nickel's publication "Nickel Topics" of interest. Here is data on Ni-Resist cast iron for use in exhaust manfolds and turbochargers with some typical applications.

Jetapower's New Line of 20-KW Power Plants Described

Jeta, Inc. has released a new bulletin on their line of 20-kw and 15-kw diesel-electric generating plants. A description of the engine, generator and controls is concisely contained on one page and a schematic drawing, plus a list of accessories covers the second page of this two-color publication.

The IAE Story

Illinois Auto Electric Company, at the opening of its new Forest View Division plant, distributed a booklet called "The IAE Story" which does an exceptionally good job of describing the firm's facilities. IAE is one of the nation's largest independent distributors of transportation and industrial supplies servicing fleet operators, railroads, general industry and municipalities.

In addition to a really extensive inventory of more than 60,000 transportation parts and supplies. IAE offers three types of services-on-the-vehicle, detached unit and unit modification.

The booklet finishes up on a note that might well be a motto for the sales and service industry.—"We service everything we sell and guarantee everything we service."

Complete Cat Engine Line Described

An 8-page booklet which describes the complete line of Caterpillar Engines for industrial, electrical power and marine applications is now ready. The new booklet summarizes the specifications of all current models and includes photos for ready reference. Looks like a good item for your engine file. Use the readers service card to obtain your copy.

Lubricant Selector Chart

Molykote's Bulletin 121 simplifies choice of proper type of Molykote lubricant for the job. The Chart evaluates every type of lubricant made by this firm based on temperature, environment, method of application incorporation into common materials and recommendations for various parts, operations and conditions. There is also a brief technical description of each product.

Fuller's Magazine "Transmission Topics"

Volume 8, No. 2 of Transmission Topics, published by the Fuller Manufacturing Co. has a number of interesting features on the diesel trucking industry. There are five articles on commercial freight carriers, one on a private fleet and one on a leasor. This issue also features an announcement of Fullair Control, Fuller's compressed air gear shifting system and a piece on Fuller Pressure Filtration and Lubrication systems. A review of "Private Trucking Costs and Records", a study published by Texas Transportation Institute, hits the highlights of a significant bulletin from the Texas A. & M. College System.

"Lubrication of Roller and Silent Chain Drives"

This technical bulletin from Sunoco should be of interest to everyone involved with the lubrication and maintenance of chain drives. It covers various types of chain drives, giving speed classifications and lubrication recommendations. An oil selection chart is included. Simply written, this is an excellent technical bulletin on a subject which usually gets little attention.

Data on Upgrader Steam Cleaners

Clean units run better, last longer. Low cost steam cleaners are a good investment that pays off in many ways. A good example is the faster, better job you can do on mechanical work if dirt is stripped away first.

Steam cleaners sized to fit your needs—that's the key to Vapor Heating Corporation line of high output steam cleaning machines. Literature is available on the complete line of Upgrader units ranging from 80 to 1500 gph.

New IH Payhaulers

International's "817" diesel engine powers new Payhauler, rear-dump, off-highway trucks, the Model 95 (illustrated) and the Model 65.

Model 95 is equipped with a turbocharged version, the DT-817 rated 375-hp maximum at 2100 rpm. This 6-cyl, 4-cycle, direct-start engine has a 5⅜-in. bore and a 6-in. stroke. The Model 65's D-817 engine, naturally aspirated, develops 250 hp at 2100 rpm.

Model 95 has a struck capacity of 18-cu yds and a 27-ton payload. Model 65 has a struck capacity of 12.5-cu yds. and a 19 ton payload.

New Line of trucks feature corrugated bodies patterned afterrail road gondolas, which eliminate deadweight drag. They are built to take punishment. Model 95 gives speeds up to 38 mph. There is a choice of torque converter with a power-shift, or 9-speed air shift transmission. Literature is available from the manufacturer through our reader service.

Booklet on Eimco's 105 Series of Tractors and Tractor Units

Eimco 105 Tractor-Dozer; 105 Excavator; Excavator-Dozer Combination; 115 Special Steel Mill Excavator and the 125 Front-End Loader are illustrated and described in a 16-page, full color booklet. Specifications on each unit are given as well. Also featured is a run-down on Eimco's "Unidrive" transmission. If you use this type of equipment, you will want this booklet for your file.

Cat Dry-Type Air Cleaner Change-Over Groups

Caterpillar Parts Reference sheet (form 33334) covers dry-type air cleaner change-over groups for Cat D8 Tractors, 13A, 14A and 15A; D9 Tractors, No. 583 Pipelayers and DW20 and DW21 Tractors having Series F and Series H engines. Factory-packaged change-over groups include all necessary manifolds, gaskets and hardware. Remember clean air is the key to long engine life.

Diesel piston before removing caked carbon and film.

The same piston after soak cleaning with LIX Diesel cleaner.

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- GM 71 Engine Tools

76 Pages—275 Illustrations
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26 Parts Lists

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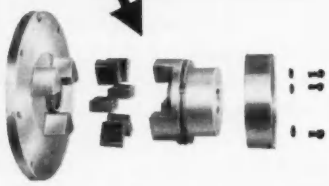

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5. Outlasts other couplings—cushions transmit load to eliminate wear on metal jaws.

Get full facts on the CF Coupling. Request Bulletin 606.

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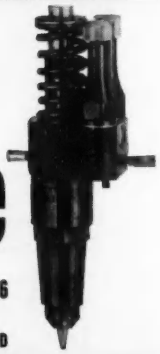

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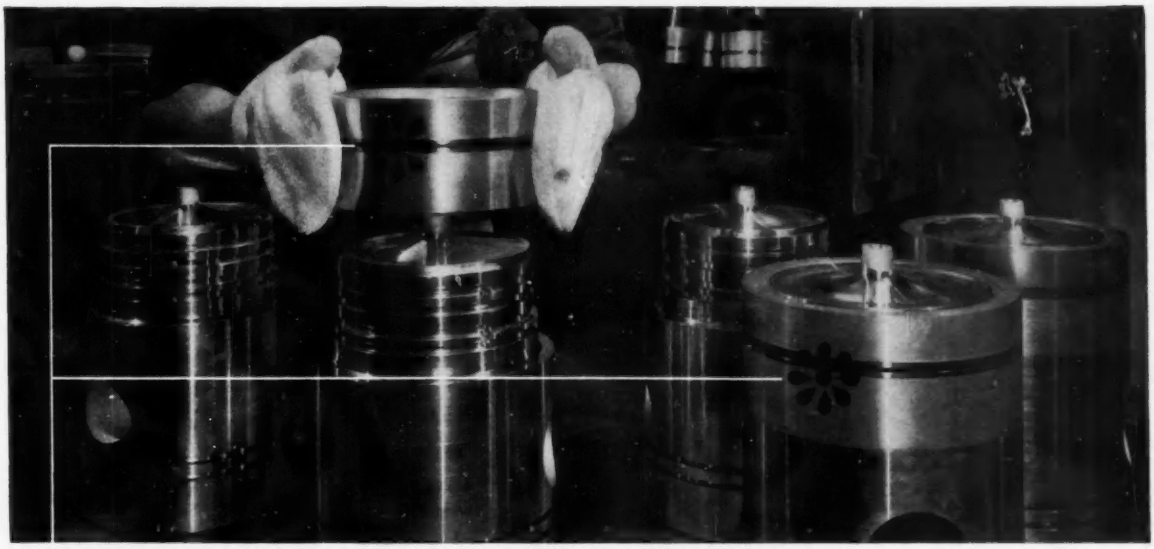

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Most Powerful Harbor Tug in the United States. Squat, pug-nosed Kings Point is powered by a 2100 HP ALCO diesel with forged aluminum pistons. All 16 pistons are equipped with Ni-Resist inserts at the top compression ring groove. The Kings Point operates out of Baltimore for the Curtis Bay Towing Company, Baltimore, Md.

Ni-Resist ring carriers keep her powerful new diesel powerful longer

Once ring grooves lose their shape, through wear, galling and heat, down goes compression, power and efficiency. To strengthen this critical point, pistons on the Kings Point's engine are protected with Ni-Resist* nickel cast iron in the top ring groove area.

Ni-Resist ring carrier inserts hold their shape longer, and keep this powerful diesel powerful.*

Ni-Resist iron effectively resists wear, corrosion at diesel operating temperatures. Ni-Resist inserts remain tight in piston service.

Ni-Resist ring carrier inserts, cylinder liners, valve guides, and exhaust manifolds can reduce your maintenance problems. Fill out the coupon on the right if you want to know how Ni-Resist can extend the life of your diesel equipment.

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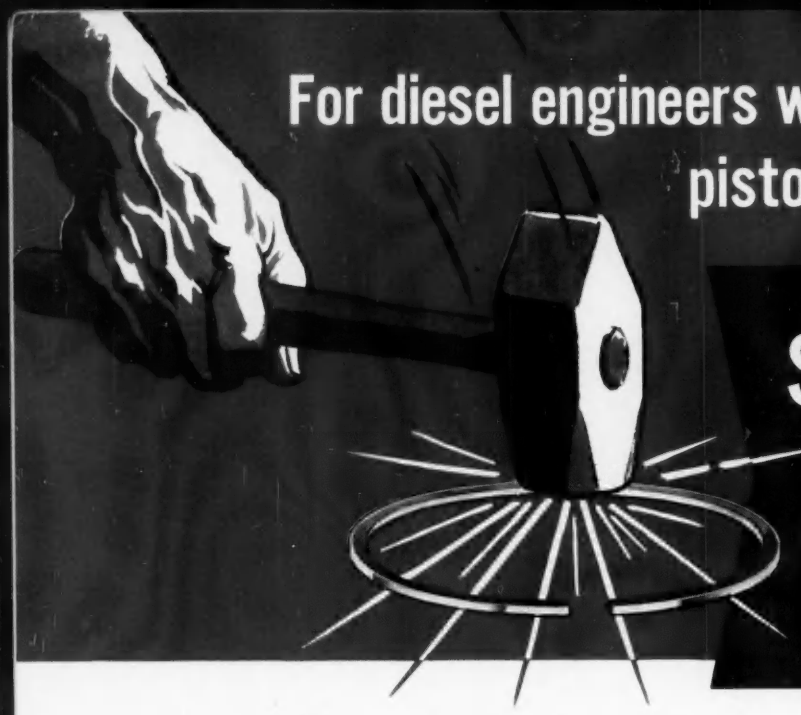

For diesel engineers who've encountered piston ring breakage...

Sealed Power Cyclan Piston Rings

They don't break in severe service where other rings have failed

Cyclan—a special alloy iron developed for diesel applications by Sealed Power engineers. Great strength. Great resiliency. Cyclan has much greater resistance to breakage under severe impact. Cyclan Rings are also chrome-plated for longer life and superior oil control.

Like all Sealed Power products, Cyclan rings are subject to stringent quality controls. In the case of Cyclan rings, 37 tests and inspections in all—some by hand, most by precision machine.

If you have encountered trouble with excessive heat, breakage, side wear or friction, Cyclan may be the solution. Discuss your application with Sealed Power's engineers. Write or phone.

Sleeves and sleeve assemblies from the world's most experienced manufacturer

Sealed Power built and staffed an entire plant solely for the engineering and manufacturing of sleeves.

That's why Sealed Power has more know-how, more experience to draw on in this highly specialized field. And its products prove it.

Every diesel sleeve, each sleeve assembly is designed and manufactured with precise care every step of the way. The components of each assembly are engineered for top performance and subject to rigid Sealed Power quality controls.

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